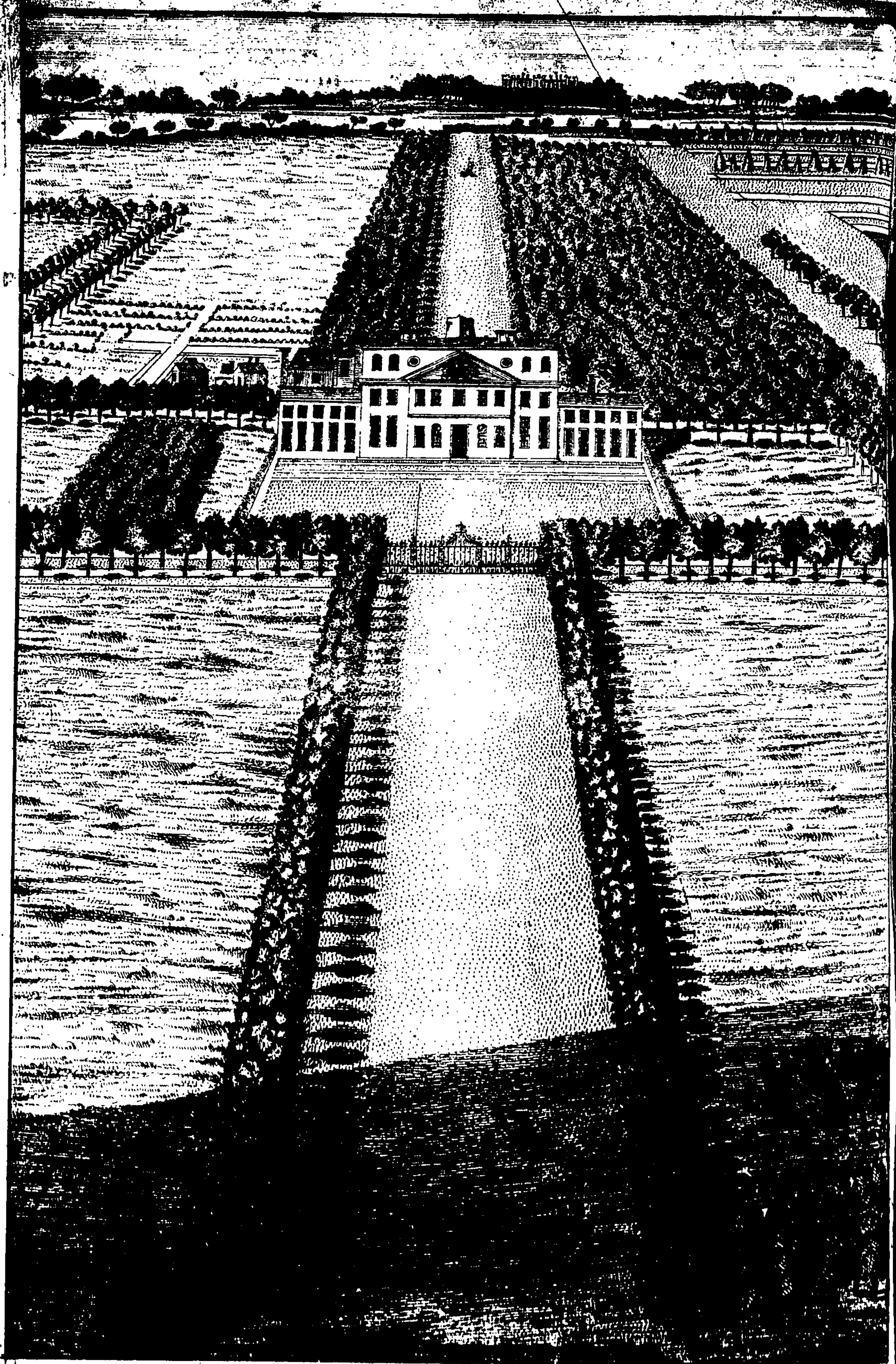


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A Perspective View of His Royal Highness's the Prince of Wales's
House at Richmond.

David Mathie Anno Christi 1770

A

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Particular Account of the famous *SILPHIUM* of the Antients.

By JOHN LAURENCE, M. A.

Rector of *Bishops-Weremouth*, in the Bishoprick of *Durham*, and
Prebendary of the Church of *Sarum*.

Omnium autem rerum ex quibus aliquid acquiritur, nihil est Agricultura melius, nihil uberius, nihil dulcius, nihil homine, nihil libero dignius. Cicero de Offic. Lib. II. Cap. 42.

Nec verò dubitet Agricola, quamvis Senex, quarenti cui serat, respondere; Dies immortalibus, qui me non accipere modo hæc à majoribus voluerunt, sed etiam posteris proderet. Cato Major, Cap. 7.

Ταῦτα δέ, ὦ Κριτόβουλε, ἐγὼ διηγῶμαι, ἔφη ὁ Σοκράτης, ὅτι τὸ γεωργίας ἔδ' οἱ πάντες μακάριοι δύνανται ἀπύχεσθαι. Ἔοικε γάρ ηἱ ἐπιμέλεια αὐτῆς εἶναι ἅμα τε ἡδυπάθεια τις, καὶ οἴκη αὔξησις, καὶ σωμάτων ἄσκησις, εἰς τὸ δύνασθαι ὅσα ἀνδρὶ ἐλευθέρῳ προσήκει. Xenoph. Οἶκον. Cap. 5.

D U B L I N:

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TO HER
ROYAL HIGHNESS
THE
PRINCESS
OF
WALES.

M A D A M,

I Esteem it the highest Honour, to be permitted to dedicate the following Papers to Your Royal Highness; Whose known Character for Virtue and Goodness, for a singular and impartial Love of Truth, and for encouraging every useful Art and Science, cannot but derive Credit upon a Work published under Your Royal Highness's Protection.

The World will readily judge, that this Presumption of mine could not proceed from any Inclination to flatter. For, That good Sense and Judgment, joined with a most endearing Affability; which has rendred Your Royal Highness so universally esteemed, and so justly beloved; makes you too wise to bear Flattery, and too Good to need it. But the Diversion Your Royal Highness is sometimes pleased to take, in viewing the Effects of such Experiments as are the Subject of this Treatise; naturally led me to be ambitious of this Honour.

I have

DEDICATION.

I have, for some Years past, employed my vacant Hours in recommending the innocent Diversions of the Flower-Garden; in being an Advocate for the Culture of my Native Country in general; and particularly in shewing the rest of the World the growing Riches and Beauty even of that more Northern Climate, which has but lately been thought capable of Improvement. And nothing could be a more satisfactory Reward to these my Labours, than the being allowed to publish them under the Patronage of a Person, who is a perfect Judge even of these meaner Performances, at the same Time that She is an Ornament to the Royal Family, and a Blessing to the Nation.

That Your Royal Highness may long live a Pattern of Virtue and Goodness, a Lover of Reason and Truth, a Friend to Virtuous Liberty, and an Enemy to the Antichristian Spirit of Popery, wheresoever found; And that these Kingdoms may, to the latest Posterity, continue to be governed by Descendents inheriting these Your Illustrious Virtues, which are the greatest Temporal Blessings to Mankind; is the Prayer of,

M A D A M,

Your Royal Highness's

Most Humble and

Most Obedient Servant,

J. Laurence.

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A NEW





T H E
P R E F A C E
T O T H E
R E A D E R.



It is now twelve Years since I first began to treat upon the Subject of Vegetables. And in those several small Tracts already published I confined my self to that Part only, which respects the *Fruit-Garden*, as what I thought would best and easiest make its Way amongst the Inquisitive Part of the Nobility, Clergy, and Gentry. Whether I judged rightly or not, I must leave to such Persons, into whose Hands those Books have fallen: But I must own my self so far encouraged by the kind Reception of those Books, that I have been several Years laying in Materials to do my Part to extend and enlarge the Knowledge of Agriculture in all its Parts.

I had at that Time the Honour of being the first and almost only Writer in this last Century, who had revived the Spirit of Gardening, and pretended to give a rational and intelligible Account of the Laws of Nature, for the better and more regular Government of Fruit-Trees, hitherto but imperfectly understood, and therefore very darkly explained. Since which Time there have arose other Authors, and very many Books have been wrote on the Subject to please the Taste of the Age; some of which have furnished us with diverting and ingenious Novelties: Tho' it must be confessed, that several others have rather obscured the Subject, and confounded the Reader; especially the *Dictionary* Writers, by inserting *all* promiscuously, both good and bad, from other Authors.

As every Age of Life hath commonly its Amusements (the more innocent the better) peculiar to itself; so almost every Age of the World hath been remarkable for some one particular Pursuit of Knowledge, wherein Men have excelled to the Advantage of their Fellow Creatures. This Age, it is plain, seems to taste and relish every Thing new on the Subject of
a Vegetable

The P R E F A C E.

Vegetable Nature; and Men are eager in their Enquiries into its Recesses. Great Light hath been struck, and more Remains to be let in. Which Consideration, instead of Discouragement, should be an Argument to excite Mens Zeal, and enflame their Ambition to find out Truth.

Many in the World are apt to be discouraged in their Pursuit of Knowledge, when they see and consider the Difficulties that lie before them; or when they observe that most Sciences have their Chimæra's, after which Men are wont to run without ever overtaking them: Whereas at the same Time it should be owned, that they are often the Occasion of our finding out many useful Things in the Way.

It doth not require a great deal of the Spirit of Prophecy, to say, that as long as the World lasts, the Pleasures and Entertainments which Gardening and Agriculture afford, will be the Pursuit of wise Men, who, whilst they find and relish Retirement, will also find the Pleasure of enquiring into the Powers of Nature, whose Returns are abundant Recompences for their most laborious Searches. And happy surely they, who find Satisfaction in those so innocent Pleasures, instead of disturbing the World or their Neighbours, when they cannot be quiet themselves, tho' no Body hurts them. The Evening of Life is thus, to be sure, most wisely and agreeably spent. When the Decline of Nature tends to Peevishness and a froward Weakness, and we cannot so firmly bear the Frowns of Fortune, the Ingratitude of a Friend, the Malice and Treachery of an Enemy; then to step aside, as it were, out of the World a little before our Time, and give such a decent Turn to our Thoughts, as may hide the Weaknesses of human Nature, and at the same Time recreate our Minds with innocent and advantageous Pleasures, hath always been, and must always be accounted Wisdom.

It must be owned indeed, that the *Town* hath its Pleasures as well as the *Country*; And if Virtue were the Rule and Guide of Mens Actions, as Man was made for Society, the Delights of Company and Conversation ought to be preferred to a private Life, and to all the Charms that Vegetable Nature affords us in Solitude and Retirement. But how alluring soever the Pleasures of the *Town* may seem to us, whilst Health and Strength and the Gaicties of Youth last; yet considering the Difficulties and Dangers, with which a Freedom in Conversation is commonly attended, as also the Envy, Malice, and Double-dealing so frequent in the most busy Parts of the World, which tend to mar all those Delights; we shall be inclined to declare in Favour of the innocent Simplicity of a Country-Life.

The antient Heathens, Moralists and Philosophers, are so full of this Way of reasoning, that you no sooner dip into their Writings, but you find beautiful Descriptions of the Pleasures of Agriculture, and frequent Examples of Men of great Merit, who fled from the tumultuous Hurry of Cities filled with raging Passions, that they might recreate both their Minds and Bodies with rural Exercises.

If Clergy-men and other studious Persons, that have a Taste for Beauty and Order, really want these reputable Relaxations, I hope there will not need a Justification of my self, that I here amuse my self and others of my own Profession with Studies so seemingly different from it. Let the Reader look back to that Place in *Tully's Cato major*, quoted in the Title Page, and he will see a noble Sentence and Sentiment of an old Heathen, which may be look'd upon as a Lesson to Christian Clergy-men, and is at the same Time a full Justification of this my Undertaking.

And truly I cannot but here take Occasion to exhort all Philosophical Gentlemen, to employ a reasonable Share of their Thoughts and Experiments

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ments on the Subject of Agriculture, as a more becoming Exercise and Relaxation than Hunting or Cards; and to be sure, more conducing to the Health of the Body, the Strength of the Mind, and to the Capacity of Generosity in the Fortune, than many other fashionable but criminal Excesses. For it ought to be observed, that it is an Employment, which will at once contract their Wants, and give a larger Ability to supply them; 'twill give greater Relish to the Enjoyments of Life, and make every Part thereof sweetly varied between joyous Ease and delightful Labour.

If there are any who can complain of the Toil of that Pleasure I am perswading them to undertake and enjoy, let them consider that just Admonition of *Epicharmis* cited and applauded by *Socrates*, τῶν πόρων πολλὰν ἡμῖν πάντα τ' ἀγαθ' ἐστί. And the wisely chosen Motto of our present Excellent Lord Chancellor, is the grateful Sentiment of a Mind who hath purchas'd Happiness by these Means. *Labor ipse Voluptas*. The Greek is an Explication of the Charter which God gave to Man when Husbandry was first made Necessary; the *Latin* admonishes us with what Thankfulness Man ought to receive the Punishment inflicted by infinite Goodness.

If Gentlemen could perswade themselves to cast their Estates into Beauty and Order, they would quickly experience it the noblest Exercise and greatest Delight.

The *Designing Arts*, are unquestionably the most becoming Retirement, as well as most natural Enjoyment of Life. God made Man as ardently desirous of the Beauty of *Order*, as of any Indulgence of Sense. The *last* may be an Injury to others: But the Love of the *first*, within the Bounds of a generous Frugality, is a Blessing; because it gives Politeness and Ornament to a Nation. If a Circle drawn on the Sand could make an old Ship-wrack'd Philosopher cry out; *Courage! my Companions, here are humane Creatures live in this Island*; surely the Sight of every Portion of a Country drawn out into all the regular Variety of some noble Design, will give Evidence of a Love for *Beauty*. Which is indeed an external Proof of a Love for *Humanity*: For none can be greatly transported with Beauty and Regularity amidst Plantations, and the Gracefulness of Order in inanimate Proportion but he must be much more so by the diviner Harmony of a *virtuous Conduct*. And if Variety in Uniformity is what delights Human Minds; what greater united Variety, than beholding all the Duties of Life drawn from the one Principle of Christian Charity, or a desire to make Happiness enjoyed, in proportion to the Merits and Capacity of Creatures endued with Sense and Understanding?

Besides, it is to be considered further, that the Delight in adding Beauty to a Country here recommended, is likely to extinguish that Secularity of Spirit, that selfish Taste, which so much reigns in the World. For this is so evidently labouring to please others, that no Man can be pleased long with what himself *doth*, if he did not believe that others would be pleased with what he *hath done*; and none could preserve a wrong Taste if there were not others to admire and applaud it. The general Admiration which every Age hath shewn for the *Quincunx Order*, is a full Proof, that Beauty consists where the ingenious Mr. *Hutchinson*, and *Monsr. Crousaz* place it; *viz.* in *Variety* amidst *Uniformity*: And this, every Farm may have added to it by small Expence and agreeable Labour, and become more Convenient as well as more Beautiful. What a Field of Pleasure then is here, for a virtuous Man; whose Products are more Relishing than what Vice can pretend to offer; where Reason will desire the Aid of Imagination, which yet submits its Inventions to Reason; where he may indulge in what will at once improve his Pleasure, his Fortune, and his Mind;

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Mind ; in what will promote the Cause of Virtue, the Good of his Country, and the Interest of his Family.

If we consult the sacred Historian, we shall see, that in the Beginning, even before Sin enter'd into the World, *God planted a Garden, wherein were made to grow every Tree that is pleasant to the Sight, and good for Food, and there he put the Man whom he had formed, that he might till it and keep it*, Gen. ii. 8, 9, 15. And thus also we shall find, according to the Language of the Poets, that the Golden Age was spent not in Cities, but in the Country ; where the first, most innocent, and happiest Men, applied themselves to cultivate the Earth, no less for their Pleasure than Advantage.

Not that it would be a reasonable Attempt, to perswade all Persons to turn Farmers and Country-men. Men may be useful as well as necessary in every Station of Life. Multiplicity of Business in some, and the Love of Ease and Voluptuousness in others, hinder both the Study and the Practice of Husbandry ; so that the Culture of the Earth is now fallen to the Lot of Men, whom we esteem servile and born to Labour. However, it were to be wished, that Men of Thought and Leisure would more apply their Study and Care to improve their Estates ; that they would join Experience and Practice to Theory, and do their utmost to perfect the Knowledge of Agriculture and Planting, and this with the same Diligence wherewith we see others have endeavoured to bring to Perfection divers Arts and Sciences, that are less useful in Life.

The Philosophical Transactions of the Royal Society are standing Memoirs of the Zeal and Activity of many Persons of Quality and Learning, that have made several excellent Discoveries to this End ; having advanced much Light in the Art of Husbandry, by their learned Discourses and Experiments.

What I aim at in the following Papers, is to diffuse, improve, and lay open all such important Secrets, as are fit for Country-men and Peasants to know ; to inculcate even on the common People all the most rational Methods of improving Land, and managing Farms to the best Advantage ; and to add all the late and useful Discoveries of the Learned, that relate as well to Agriculture as Gardening ; that the World may reap the Advantage of them in regular Crops and plentiful Harvests : And that we may no longer have Reason to apprehend those dreadful Scarcities, with which both City and Country have from Time to Time been so sorely and grievously afflicted.

Some perhaps would expect, that a Performance of this Nature sent into the World under the Name of a Clergy-man, should have had the usual Embellishments of Marginal Notes from the *Antients*, to shew that I had consulted what they had all said *de Re Rusticâ* : And that, in the Body of the Book, according to the Fashion of some Moderns, I should have diverted the Reader with frequent Citations from the *Greek, Latin and English* Poets. This I might have done, and have acted the Part of the Philologer, as well as the Philosopher and Husbandman ; but that I think such a laborious Search, at best, only like other *difficiles Nugæ*, a pompous Way of saying nothing to any real Advantage or Advancement of Knowledge. I confess therefore I have voluntarily omitted such useless Learning ; my End in writing, being to *instruct*, not to *amuse* the Reader with Authorities from those who knew little of the Matter, in Comparison of the Light we now enjoy. So that though I might without much Difficulty have put on the Ornaments of the Scholar ; yet I rather chose to appear *Simplex Munditiis*, to dress with nothing but that natural Evidence and Beauty, which the Importance of the Subject required to recommend my Discourse.

Gratitude,

The P R E F A C E.

Gratitude, and a becoming Sense of the Favour of my Lord Bishop of *Durham*, naturally invite me to take Notice here, that by his Lordship's Bounty I have been removed (very agreeably) into the *Bishoprick of Durham*, which may properly be called the *Garden of the North*. For if Trade, and a Multitude of Inhabitants; if the natural Riches of the Country, and Wealth, acquired and improved by the hasty Diligence of a wise and polite People; if the natural Goodness of the Soil, and the Situation of the greatest Part of the County; if any, or all of these, tend to make Improvements both in the Field and Garden; here we may see them all, growing and increasing every Day into such Beauties, as raise a very agreeable Surprise in Strangers, too often prejudiced against the *North*. These Things have opened to me a new and different Scene, and have given me Opportunities (as the Reader will observe) to take Notice of many Things worthy of Imitation, and to ingraft upon them some other Improvements, not yet put in Practice.

It is fit that I should here acknowledge, and put the Reader in Mind, that in treating of Forest-Trees, I have made Use of the ingenious Mr. *Evelyn*, who hath wrote with most Sense on that Subject; endeavouring to reject what is superfluous, or too much tending to Superstition, the Bane of all true Knowledge: And moreover, that I have been beholden to Mr. *Houghton* on Husbandry; and withal, that I should have made more Use of Mr. *Mortimer*, but that I found I could not depend upon him; being at same Time well assured, that if a Farmer was to practise every Thing, and in the Manner he recommends it, he would soon become a Beggar.

I have been honest and careful not to mislead the Husbandman, by indulging any mere Speculations, or recommending what I am not sure is true and profitable. I could have indulged my own and the Reader's Fancy, like too many Authors on this Subject, with Variety of Methods of Improvement, which might have promised Mountains, but would have disappointed the Hopes of the Industrious, that should endeavour to reduce them into Practice. Such *Chimera's* are what delight and flatter the Covetousness of the Reader, but (like *South-Sea Stock* in the miraculous Year 1720.) they would bring those that trust them to real Poverty, by tempting them to catch at imaginary Riches.

Let not the Farmer expect Novelties in every Page; let him not wonder if he finds his every-day Practice plainly and concisely related. My Book is not (as I have observed) designed to *amuse*, but to *instruct*; being filled with Truth, not Fancies. And Truth is so plain and obvious, that in great Measure 'tis known to all in every Age: And those Discoveries which are here new and first mentioned, are so genuine and so natural, and so resembling to common experienced Maxims, that People will scarce believe that they are not part of the most obvious Methods.

I think it not becoming the Integrity of my Character, to mislead. And therefore when I am not quite certain of what I publish, I mention my Diffidence, and give warning that if any try what others recommend, or I relate with Caution, they may not blame me. 'Tis right to propose things to Consideration, to incite to Experiments to engage the Abilities of others to improve further. And often a Hint (tho' not exactly true, as first given) may occasion the noblest Discoveries.

I could easily have swelled the Book to a greater Bulk; but I desire to be as short as is consistent with Clearness; not aiming so much to write *Multa*, as *Multum*.

I have translated one Chapter of *Kempfer*, which I hope will encourage some Person to give the Whole to the Reader. Scarcely can one find any
b where

The PREFACE.

where more curious Things concealed under dark Language. Reading him, is like travelling over those craggy Rocks and rough Mountains, that he went over to gather his Observations and compose his Treatise. And many who would have been delighted with his fine Observations, could they have seen them at once, will not think it possible that any thing can reward them for the unpleasant Pains of understanding him.

I should think my self extremely happy, if I could be instrumental in reviving among Gentlemen, whose Affairs do not oblige them to spend a great Part of their Year in *London*, a Spirit of improving their Estates and imploying their Time in making Experiments, which cannot be expected from the Farmer. He, whose Thoughts must be fixed on making up his Rent and maintaining his Family by early and constant Labour, cannot venture the Expence of a Trial, which, if it should not succeed, must deeply injure his Fortune, and half starve his Children. But the very Pleasure and Amusement, which a Gentleman will find in such Exercise of his Body and Mind, will be cheaply purchased by the Loss he may sometimes meet with.

How many Volumes of Mathematicks are daily composed, merely for the Pleasure of the Study, without Application to any thing useful? Many Books were wrote on the Conic Sections, before the Use of any of them were furnished; tho' now we know that they are used by Providence in the Conduct of Nature; and, without such formerly barren Meditations on the Properties of those Figures, we at this Time should not have rejoiced in the glorious Discoveries of a *NEWTON*.

The very Beauty of seeing such infinite Variety of Truths united in one general Theorem, strongly engaged in Mens Contemplations, before they suspected that Planets moved in the Eclipse; that *Projectiles* describe a *Parabola*; that Fluids ascend between Glass Planes, or in a Series of gradual Tubes, so as form an *Hyperbola*. From which surprizing Observation, the rising of the *Juices* in Plants can alone be clearly explained.

Gentlemen therefore may at a small Expence here employ their Philosophical Thoughts, and preserve their Health, if they cannot reap other Advantages: But frequently their Prudence and Care will have other Recompence, besides that enjoyed in the very Labour and Search.

As Virtue and Wisdom are their own Rewards, and the Relish in the Practice of them is infinitely more delightful than any other Enjoyment; yet they lead to every other Enjoyment which is worth desiring: And as reading of History, is itself highly entertaining, yet, besides the accompanying Pleasure, a Man gains from thence Knowledge and Wisdom in the Management of the highest Affairs in Life: So is Agriculture greatly delightful in the very Labour, as well as attended with the most advantageous Returns. 'Tis not like the Toil of the Hunter, where the Game when caught is despicable; but the Exercise thereof is as much more wholesome and more agreeable, as the Game (give me Leave to call it so) is more valuable.

But whether *Gentlemen* will live in the Country or no, most of my *Brethren* must, because it is their Duty. Many of the common Diversions they cannot attend with Decency; yet some Relaxation and Refreshment they require. Their *Glebes* are therefore proper for that Purpose; and too many of them want not only the Amusement, but the Advantage which will arise from a skilful Labour. But I will not exhort them any farther in my own Words, but refer them to such as will be more effectual. *Tully* makes *Cato* recommend *Xenophon's* Oeconomicks to *Scipio* and his Friend, as the most powerful Pleader for this noble Art. *Tully* was so delighted with

The P R E F A C E.

with the sweet Simplicity and Majesty of good Sense which shines in that Treatise, that he translated it into Latin. His Version is lost, but the Original is still preserv'd, and will more effectually perswade Men to love the Study of Husbandry, than any thing that I can say.

Xenophon hath obtained the Admiration and Love of every Age; and no Age was ever better inclined to regard the amiable, the elegant, the unaffected Neatness and Strength of that Author than the present: And I hope the Rules that Men are forced to admire, they will obey.

I will only add, and submit with great Humility to our Legislature the Project of a Friend of mine, which will be a great Ornament to our Nation, without any Expence: That a Clause should be added in every Bill for mending the Roads, (and it may be made to extend to those already granted,) to oblige the Undertakers to plant and preserve on each Side the Turnpike Roads, such Timber-Trees as the Soil will best bear, and the Country wants; which will supply in Time the Loss of those Woods that are daily destroy'd. If this Hint happen to make any Impression, I may possibly my self in due Time, communicate my Thoughts to the World, not only about the best Way and Manner of planting such Trees in the Road for their future Security, but also concerning the cheapest and most expeditious Method of mending the Roads themselves.





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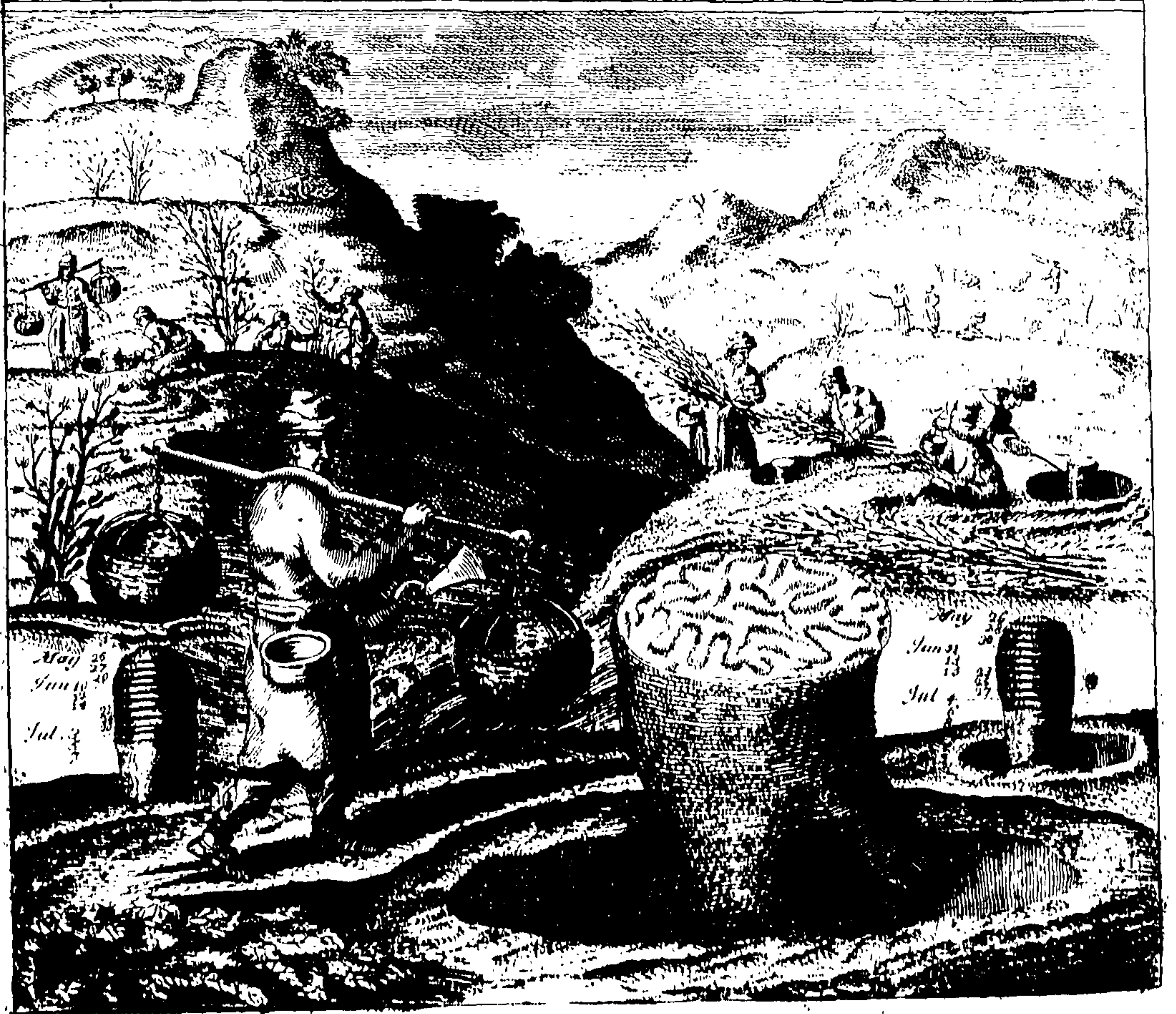
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Passion Flower and Fruit.





A
NEW SYSTEM
OF
AGRICULTURE
AND
GARDENING.

BOOK I.

Of Husbandry in the Field, and its several
Improvements.

INTRODUCTION.



*A*IR, *EARTH*, *FIRE* and *WATER*, being known to have their Effects, and various Influences in Husbandry; and, if made to exert their natural Properties in a due manner, and regular proportion, to contribute greatly to the Improvement of Land; it may be expected that I should take some particular Notice of them in a Philosophical manner; and yet so, as with a View always of bringing *Theory* down to *Practice*.

C H A P. I.

Of A I R.

BY the *Air*, is commonly understood that Fluid wherein we live and breathe, and which covers the Earth to a considerable Height in a different Density. But this is more properly called the *Atmosphere*; which is a compound Mass made up of light and fine Atoms, or small Parts, such as are the *Effluvia*, or Streams of all sorts of Matter, *viz.* Water, Smoke, Plants, Animals, Nitre, &c. But the much greater Part thereof is a pure and native Substance of its own kind, which we call *Air*.

Air is a diaphanous fluid Substance, whose Parts mutually avoid each other, and by means of that Avoidance become *Elastic*. Whether this mutual Avoidance arises from a Law of the Fluid it self, or from its being attracted stronger by the *Fluid of Fire*, of which some curious Naturalists of late speak, than the Parts are by each other, is not easy to determine. The Parts of Salts mutually *attract* each other till put into Water, and then they mutually *avoid* each other, dispersing all over the dissolving Fluid; and it is certain, that Heat will certainly encrease the Elasticity of *Air*. The *Air* is also *compressible* and *dilatable*; for the lower Parts thereof are always more compressed than those above, and reciprocally proportional to its Compression, its nearest Particles receding from each other with Forces reciprocally proportional to the Distances of their Centers.

It is also to be observed, that the *Weight* of the *Air* is different in different Parts of the Year, and in different Seasons of the Weather; altho' Heat and Cold make no greater alteration than this, *viz.* 'Tis scarcely ever less than 800 Times specifically lighter than Water, and in its natural State seldom more than 1000 Times; tho' in Condensers it may be compressed to a much greater Degree, and by Heat and an Air-Pump expanded to a surprising Rareness.

But because the Nature and Properties of the *Air* are either not generally well understood, sometimes darkly explained, and seldom set in a clear Light; all Philosophical Persons will expect something new of this Kind, from one that engages to give an intelligible System of Vegetable Nature. And I own, I rather take upon me the Part of the Philosopher, as well as the experienced Husbandman; because I acknowledge my self to have been greatly assisted by the Conversation and Correspondence I have had on this Subject with some ingenious and learned Friends.

Having said that *Air* is an Elastic Fluid, which surrounds the whole Earth, it is but necessary that this be said further here also; that by an *Elastic Fluid*, is meant a Fluid whose Parts mutually avoid each other, from what Cause soever that mutual Avoidance comes. For,

The Consequence of this Property of the *Air* is, that its Density (as was hinted before) will be in proportion to its Compression, and that the higher you ascend, the thinner is the *Air*. Hence it follows, that was the Atmosphere of much *less* Altitude than it is at present, or of much *greater*, neither Plants nor Animals could subsist, at least not *so well*, as they do at present. Had it been of much *less* Altitude, than the Air we breathe would have been proportionably *thinner*, and less fit for Respiration; for 'tis generally observed, that at the Top of very high Mountains, (such as the Pike of *Tenariffe*, which may be near three Miles perpendicular Height) Animals respire with difficulty. Had the Altitude of the *Air* been *considerably less*, we should feel much greater difficulty still.

Besides, we find that the *present Density* can only bring up Vapours to the Height of Hills, and Tops of Mountains, where they continually hang till they dissolve in Rain, and so run into and form Springs: So that if *Air* was on the Surface or horizontal Plane but even as light as now it is on the highest Mountains, we should live in a perpetual Fog, and both Men and Vegetables be destroyed for want of free Perspiration; for Vegetables must perspire also, or they starve. By Dr. *Woodward's* Experiments, it appears that daily many hundred times as much Water as the Quantity of the Augment is carried thro' the Vessels; and when those Juices come to the perspiratory Orifices, if the *Air* was not of a proportionable Weight to buoy up and carry off the watry Excrement, it would there stagnate, and by the Vessel's being already full, prevent new Juices from ascending; and consequently, prevent all Nourishment from arising in the Tubes.



'Tis possible indeed, that some few sorts of Plants may have Perspiration fine enough to be carried off by *Mountain-Air*, as the Fir-Kind, and some other Plants, which delight in Hills; but all the other Varieties would be lost by a much lower, and consequently *thinner* Atmosphere.

Thus therefore it is seen a *certain* proportionable Quantity of *Air* is necessary to Vegetation, to support Vapours, to carry off vegetable Perspiration, and by Winds to agitate and shake the Trees, to hinder the *Secretory Glands* (if I may use that Metaphor) from being obstructed. This will serve to explain the odd Phænomenon of the *Fountain-Tree* in the Island *Fero*, which drops such Quantities of Water. It differs only from other Plants, as a Man who perspires freely doth from one who sweats profusely; the Orifices of his Vessels are so large, that the Particles which exude are too heavy to be carried off. These therefore run into each other on the smoth Leaf, and form there Drops which fall and refresh the Earth.

Thus in our Country, the *Ros Solis* hath its Leaves in the hottest Weather surcharged with a very large Drop of Water, which it constantly fills faster than the Sun can drink it up. Hence also follows the Reason why Wood-land Countries are so damp and aguish; for if the Perspiration of Vegetables be *so great*, no wonder that the *Air* is *so moist*. And this, by the way, may serve as a right and seasonable Caution to all Gentlemen who value their Healths, not to be too busy and profuse in the Ornaments of Planting, as they commonly are, especially too near their Houses: But yet, at the same time, another Hint may be taken from hence, that some Trees may by their Quality and Quantity of Perspiration make the *Air Medicinal*. The Turpentine Kind throws off a large Quantity of warm active Particles, and probably would much contribute to the Salubrity of a Gentleman's Seat. For that the Sweat of those Plants is warm, may be collected thus: That in great Numbers *closely* growing, they cherish and defend each other against the Cold of the bleakest Climates; while *single*, they grow stunted in very temperate and sheltered ones.

This is sufficient to shew the Inconveniencies which would follow, supposing the Atmosphere *less high*. And yet it is as easy to shew, that not fewer would arise, if the Atmosphere was *considerably higher*: For in that Case, the Compression of the *Air* on the Earth's Surface would be greater, and consequently the *Air denser*. 'Tis true, we might *breathe* as well in such a compress'd Air; as is proved by the Gentlemen who have continued long in diving Bells, and by Animals which have shewn no Uneasiness in *Condensers*: But in every other respect, the Change would be fatal; for, first, the Vapours would be carried up to so great an Height, that they would not descend in Rain, unless it be when Storms considerably altered the Density below: Dews would never fall: The Clouds would be carried up so much higher than the Tops of Mountains, that the Vapours would not be stopped by them, and condense there, and return in Streams to the Sea. And thus the Face of the Earth, in great measure, would cease to be refreshed with Water; at least, it would not be nourished with that regular and gentle Moisture it rejoiceth in at present; tho' now and then the Flood-Gates of Heaven might be opened, and the * *Waters above the Firmament* be poured down in Cataracts to *destroy* rather than to *bless* the Fruits of the Earth.

Besides, had the Density of the lower *Air* been *considerably greater*, on every Storm, nothing could have withstood its Force, the *Momenta* of Bodies being as their Quantities of Matter multiplied by the Motion. Thus wisely hath the Author of Nature chosen *that only Density* of our *Air* and Height of our Atmosphere, which was relative to our Necessities, and the Nature of Animals, Plants, and Water. And thus both the Christian and the Philosopher may behold, with an Heart opening with Gratitude, that there is a *Meliority* observable in every Thing.

I have taken notice, that one Necessity why the *Air* should not be much denser, was, that Vapours should not ascend above the Brows of Hills, because by that means Fountains would have been prevented; for the Origine of Springs chiefly arises from those. It is well known, by Dr. *Halley's* Experiments, that Vapours arise in proportion, not to the *Depth*, but to the *Surface Waters*. 'Tis known, that all the Rivers running into the Sea, never increase its Bounds; for if it gets in one Place, it loses as much in another. And again, it is not less well known, that the Winds from the Sea bring us our Rains. If therefore we have not *too much* Rain and Dew; if not *too many* Springs and Rivers, as every one confesses we have not; then the Quantity of Sea on our Earth is but in such a proportion, as is necessary to make the dry Land fruitful and habitable: And we see, that what is brought from thence, and returned thither, doth but just keep the Balance *even*.

* Gen. i. 31.

The next Observation that offers it self to be made on *Air*, is, that its Quantity continually, in some small degree, *increases* and *decreases*: Inasmuch as no Fermentation whatever but loosens from Bodies some Particles, which have a mutual Avoidance, and become therefore *Air*. Put any Fruit, or Bread, or dead Animal, in an exhausted Receiver, and in a few Days, by corrupting, they will fill it again with a vast Quantity of *Air*; which could not be, if the corrupted Effluvia were not turned to *Air*: But yet it is an *Air* so noxious and imperfect, that if by a Transferrer 'tis thrown on any Place where a Bird is confined, it immediately falls into Convulsions and expires. Not unlike the manner by which Dogs are destroyed in the *Grotta del Cani* * in *Italy*. Again, If a few Particles of Gun-powder are fired in an emptied *Air-Pump*, when the *Quicksilver Gage* is risen to the Height of the Barometer, it immediately *sinks*, as if the whole Atmosphere was re-admitted. If two Oils, which burst into Flames when mingled, are put together in an exhausted Receiver, they not only generate *Air* enough to sink the Gage, but to burst the Receiver with incredible Violence.

Thus every Fermentation shakes off Particles of *Air* from the Bodies to which they were united. But as *Air* thus continually *increases*, it also as continually *decreases*: For as it constantly ascends in the Tubes of Plants, great Part of it remains there, plumping up the Fruit, and filling the Vessels, as well as Water: And tho' the Parts of *Air* avoid each other, they still unite with all other Bodies.

Hence therefore may be learnt, that *Air* is in ordinary Cases useful to Vegetation, to carry up the Juices, to open and support the Vessels against the Pressure of external *Air*, and to swell the Fruit; but it may be also *useful* to the same purpose, by mingling great Quantities of *Air* with the Soil, to replenish it with what is so necessary for the Growth of Plants. These Hints are sufficient to put others upon enlarging on such Particulars.

I pass on to another Property of the *Air*, viz. Its being capable of a surprising *Rarefaction*. Mr. Boyle hath shewn by Experiments, that it may be *thinned* 14000 times more than what it is on the Earth's Surface, even *without* Heat, but vastly more *with* it. Dr. Halley has calculated how high our Atmosphere is by the Duration of the *Twy-light*; but that Calculation only proves, that the *Air* is not strong enough beyond that Height to reflect and act on Light, tho' it may still be of considerable Strength and Force. Thus in the Water-Bubble, which Boys blow up with Soap; the Skin of Water becomes at last on the Top so *thin*, that it can reflect no Light, and looks therefore *black*; but still 'tis a *Skin* of Water.

The *Air* may also be many Miles higher than that Part of it which hath Force to bend a Ray. The *Ball* of Light, which a few Years since surprised at once so many distant Countries, proves, that sulphureous acid Vapours to ferment with them, could be suspended several Miles higher, than that Part of our Atmosphere which causes *Twy-light*: And indeed from this great Power of *Dilatation*, part of its Activity in Vegetation arises. When by internal and external Heat it expands itself, it *ascends*; and by ascending carries with it the surrounding Films of Water, saturated with vegetable Salts, (*Et pua data porta ruit*) enters into every open Orifice, and consequently into all the *subterraneous* Pores of Vegetables.

The next Thing I shall take notice of is, not what is properly a Quality of the *Air*, but of *what it contains*; but yet is the principal Thing, by which it becomes a *Manure*; and that is, an *acid Spirit*, with which it is plentifully repleted, and by which it performs many of its most surprising Effects. 'Tis this which corrodes *Iron*, and turns it into *Rust*. 'Tis this which corrodes *Brass* and *Copper*, and turns them into that *Rust*, which is called *Verdegrease*. 'Tis this which, uniting itself with the Salt of Lime, forms a *Nitre*. Distil from *Vitriol* all the Oil you can, expose the Remainder for some time to the *Air*, and it will thereby be so repleted by this acid Spirit, that it will render it able to yield plentifully on a second Distillation. 'Tis this *acid Spirit*, which twitches the Stomachs of those who continue long in a free *Air*, and gives them the pleasing Sensation called *Hunger*; which *City-Air* (where this *Spirit* is blunted by Smoke, gross Perspirations, and Stagnating,) is not able to bellow. 'Tis this which feeds *Flame*; for when 'tis blown upon the minutest Fire constantly, it makes it *burn* with Fierceness.

This also accounts for that odd Appearance of *Sun-shine putting out a Fire*: The Heat of the Sun sublimates and draws away a great part of this *acid Spirit*, which was necessary to nourish the Fire. Nigh to a Fire there is always a *Rarefaction*, which makes the fresh cool *Air* flow in, and bring with it *that Spirit*; but when the Sun shines, the *Rarefaction*

* See MEDE of Poisons.

is nearly equal all over the Room, and consequently no such Current or fresh Supply near the Fire, which was so necessary to keep up its Vigour.

'Tis this *acid Spirit*, which, fermenting with sulphureous Steams, causes all the Thunders, and Lightnings, and other fiery Meteors. This therefore, when the Soil is turned up, joins and ferments with the Sulphur and Salts of the Earth, whereby it becomes a kind of Nitre, that mellows and relaxes the Soil, thereby permitting the fattening Dews to penetrate and enrich it.

The great Quantity of this *acid Spirit* (whose volatile Particles are endued with a violent attractive Power, which they exert towards every thing; and therefore makes them capable of uniting with, and rushing to, and consequently agitating every thing;) This *acid Spirit*, I say, which pervades all our Earth; and performs the greatest Wonders which we admire and gaze at, is a Principle in Philosophy, which till of late was neglected, tho' of universal Importance to Mankind. The Attractions of *Gravitation*, of *Magnetism*, of *Electricity*, exert their Effects at such great Distances, as to fall under every one's Observation: But this different amazingly powerful Attraction of the *Acid*, exerting itself only at minute Distances, was not known, till *Experimental Philosophy*, reason'd on by Sir *Isaac Newton*, discovered it. The efficient Cause of this is perhaps as yet unknown; as likewise of *Gravity*, of *Magnetism*, of *Elasticity*, of *Electricity*, of *reflecting* and *refracting* Light. But the *Facts* are indisputably proved; their Laws are discovered and discovering; their Consequences observed, and to be regarded; and possibly these hereafter may lead to the Knowledge of the *efficient Cause*. But if *this* cannot guide us thither, *nothing can*. Tho' perhaps this Knowledge we have is as far as our Capacities, are made to arrive, or our Necessities want to carry us.

There remains yet one other Property of the *Air* to be considered; and that is, its *Weight*. And the *Whole* of this is found to be equal to about a Cylinder of near 35 Foot of *Water*, whose Base is the Superficies of the Earth. The Pressures of Fluids are every way equal. Every thing is therefore pressed by the *Air Horizontally* as well as *Perpendicularly*. When this Weight is agitated by Winds, how must it squeeze and break and moulder the Clods of Earth? How must it squeeze the Sides of Plants, and force out the Juices at every Pore? Was it not for the Quantity of *Air* within the Vessels to resist its Force, all the tender Plants would be flatted as thin as Paper.

To calculate the Pressure on a Tree a little. Every square Foot sustains a Weight equal to 35 cubical Feet of Water, as before observed. Every cubical Foot of Water weighs 76 Pound, *Troy Weight*; therefore every square Foot of any Body on its Horizontal Plane sustains a Quantity of *Air* which weighs 2660 Pounds. Every Tree therefore of 12 Inches Diameter, and suppose 20 Foot high, will be pressed by a Weight of 160000 Pounds. The different Pressure which such a Tree would receive from different States of the *Air* would be more than that of 10000 Pounds, supposing both at rest. But from either in Motion, the *Momentum* must be often much more different.

This happens, tho' our *Air* is (as I have already observed) more than 800 Times rarer than Water. But had our Atmosphere been *higher*, this amazing Weight would have been still *greater*. And how, think you, must Plants be affected by such a Force? How must Clods of Earth, exposed to it, lose their Cohesion, and be crushed? How must Dissolution be assisted by such a surprising Power? Its Weight, its Rarefaction and Condensation, its Elasticity, the acid Spirit it contains, and the Vapours it supports, carrying from Place to Place all the finer Materials fit for Vegetation. All and every one of these, tend to shew how considerable a Share the *Air* hath in that truly divine Contrivance, of handing down with undiminished Beauty the Furniture, which at present is of Ornament and Use to the Globe, through the latest Generations.

Were it not that I should be accounted tedious in this *Chapter*, there might be suggested many Meditations on the abstrusest Parts of Vegetable Philosophy, as *clear*, and *evident* as they are *uncommon* and *unknown*, sufficient to remove Difficulties that perplex the Minds of Enquirers, and make the Wisdom and Contrivance of the great efficient Cause, the grand Parent of the Universe, the mighty God and Lord of all Things, who is the Object of our Worship and Praise, to be the Object also of our greater Admiration and Love!

The Use and Necessity of *Air* towards preserving the Life, and forwarding the Increase of Vegetables, being plain and obvious by every Day's Experience; I shall only mention one familiar Fact of Mr. *Ray's*, mentioned in *Phil. Trans.* No. 23. who saith, "That Lettuce Seed being sown upon some Earth in the open Air, and some of the same Seed at the same Time upon other Earth in a Glass Receiver of the Air-Pump, afterward exhausted and cleared of all Air: The Seed that was exposed to the Air was grown an Inch and half in eight Days Time; but *That* in the exhausted Vessel or Receiver that

“ was cleared of Air, grew not at all: But the Air being afterward let into the empty
 “ Receiver, the Seed in the Space of one Week grew up to the Height of two or three
 “ Inches.

From hence may be gathered the Necessity of *Air* for the Birth, as well as the Continuance of Life and Motion of Vegetables; and that the probable Cause of both is from *Action* and *Re-action*. The Trunk of a Tree or Plant, is no other than a Canal made up of lesser Pipes, through which the Juices are driven by Heat toward the Top, and by the outward Pressure of the Atmosphere are forced from a larger to a narrower Space. And that the Juices, when forced up, may not fall down again, there are Valves in those Pipes to prevent them from returning the same Way; but when they have arrived at the Top, they return by other Vessels, which may be called Veins. And thus Circulation is performed.

Tho' I am far from being of Mr. *Bradley's* or his Correspondent's Opinion, with respect to the Use of *Earth*, in the Business of Vegetation, viz. *That its chief Use is to keep a Tree or Plant steady*; because Dr. *Woodward's* Experiments (as shall be seen presently) directly prove the contrary: Yet I am so far convinced of the Necessity and Use of *Air* for Vegetation, that, by Experiments of my own, I find several Sorts of *Sedums*, and some bulbous rooted Plants, will encrease both in their Roots and Branches as they are hung up in the open Air, without the Help of solid Earth to stand in. This only proves the Use and Advantage of Air for the Life of Plants; but not *negatively* against the Necessity also of earthy Particles, of which the Air, and chiefly the lower Part of the Atmosphere, are always full. And accordingly, the *Sedums* are ever observed to grow and flourish most, when the Air thickens and tends to Rain, or in Mists and Fogs; when by all Experiments, it is found the Air is fullest of terrestrial Matter.

I cannot but think it very probable that the bulbous Roots of Turnips, which arrive to so great a Bulk from so small a Seed, and are observed to give such Riches and Fattness to Land, receive the greatest Part of their Nourishment and Augment from the fattening Moisture of the Air thro' the Pores of their Leaves and Rhind: Inasmuch as 'tis amazing into how small Vessels, Water will insinuate its Particles. For this Purpose,

Take a Whip-Cord fastened to an Iron-Hook; at the other End hang any Weight of what Magnitude you please less than will break it; then wet the Cord with a Sponge, and you'll find the suspended Force overcome, and the Weight raised, by the Water insinuating itself into the dry Tubes of the vegetable Substance; and by being there, dilating them *laterally*, and consequently shortning the Perpendicular.

The Globules of Water must be considered as *Wedges*; the horizontal Pressure of the Air as the *Force* acting on the Wedges. The Power of Wedges to enter any Body, is known to encrease in small Angles, nearly as the Angle decreases in a reciprocal Proportion, that is, in this Case, as the Smallness of the Diameters of the little Spheres of the Water. *Air* will not enter where Water meets no Resistance, either because the Particles of the One are much smaller than those of the Other, or that their mutual Avoidance prevents their confining themselves together in an extremely narrow Passage.

If a Cord suspended a Weight equal or superior to a Cylinder of Air, whose Base was equal to the square Inches of the Surface of the Cord, I should doubt whether 'twould be possible for Water to be forced into and dilate the Tubes it is composed of: Nor does the famous Story of the *Antonine Pillar's* being brought into its Place by a Shower of Rain, when Engines could perform no more, and the Workmen despaired of accomplishing their Undertaking, prove the contrary; for the Multitude of Cables which must have been then employed about erecting that monstrous Stone, may be easily imagined to sustain an Atmosphere of Air of greater Weight than that huge Stone and therefore would drive the watry Wedges into the Pores, and by extending them *laterally* shortened the Cords, and performed the Business to the Amazement of the Vulgar, who presently cry'd out, *A Miracle, a Miracle!*

Thus we see even Deal Boards swell with Moisture. And if when dead and dry, and their Tubes contracted Vegetables can suck in Water; when growing, why may they not likewise swell, and when their Pipes are tender, open and dilatable, receive Nourishment often that Way also? And this may give a rational Account how some Plants may swell to an astonishing Size without robbing the Earth of much of its Treasures, and yet at the same time, either by rotting on the Soil, or by passing thro' the Bodies of Animals, give Riches which they never received from the Earth.

Perhaps bulbous Plants may be formed so, as to do it in an extraordinary manner, and have large Vessels conveying down Juices: Whilst others may have Vessels so formed, something analagous to Valves, which would hinder any thing from entering, tho' it gives free Power to all from within to discharge itself.

Sir

Sir *Isaac Newton* defines *Water* (when pure) to be a *fluid Salt*, volatile, and void of Savour. And (if it would not be anticipating what I have to say on that Head) I would add, that it probably consists of small, smooth, hard and porous Spheres, of equal Diameters, and of equal specific Gravities. Their being *Spheres* lets them touch only in one Point, and so the Attraction is not very strong between themselves. Their *Smoothness* gives them Power of sliding easily over each other in obedience to every Pressure, (which is Fluidity.) By these two, their Friction in sliding on each other is almost Nothing. Their *Hardness* shews a Reason why, when free from Air or undiluted by Heat, they are incompressible. Their *Porosity* explains why 'tis of so small a specific Gravity. Their *Roundness* fits them to be lapp'd about by every thing which is flexible, and to carry it where it goes. The various Flavours and Quality of Water arise from the Mixtures, with which it is saturated. All Liquors are more or less fluid, as there is a greater or less mixture of other Bodies with watry ones. *Spirits* seem to be *Sulphur* wrapped round the Globes of Water, and intimately united with them in such a manner, as to keep their Particles at a greater Distance than before, to lessen its Gravity without destroying the Fluidity. They seem so closely united, that when Fire acts on the Sulphur, it carries up the Particle it had seized along with it.

I have said this *here*, the rather, that some intelligible Ideas may be formed how Air and Water with its terrestrial Matter, may be supposed to operate together in the Business of Vegetation.

But that I may, from what hath been said in a Philosophical manner of the Nature and Properties of *Air*, proceed to something practical and useful to all Lovers of Improvement in Vegetables, it may not be amiss to say something here of the different Effects of *Air* in its several different States.

What we call a *warm Air*, is made so originally from a due and regular Influence of the *Sun* immediately; or *consequently* so, from its driving Motion out of *hotter* Countries and Climates into *colder*. And this *moderate* warm Temper of the Air is what is so desirable; that it gives Life, and Strength, and Motion, to the Vegetable Kingdom: And consequently the *Extremes* are very hurtful, either scorching up the Sap and natural Moisture of Plants and Trees, or else chilling and starving their Juices and Pores by excessive Cold; even sometimes, and in some Plants, to a degree of perfect *Stagnation*, which is *Death*.

But yet it is to be observed, that for the avoiding the dangerous Effects of these two Extremes, there are even in the Air itself certain Dispositions and Qualities, which deserve to be taken notice of with Thankfulness. That is to say; In all the hot *Island Countries*, there are observed to blow at certain Times cool and refreshing Breezes, coming over Land; from the more Northern Parts. And it is found by Experience, that a cold Air doth not so soon lose its cold Quality coming over Land, as when coming over the Sea. So on the contrary, it is found that the Salt Particles of the Sea Water mixing themselves with the Air, do greatly hinder and prevent any Intenseness of Cold in such Countries as lie near the Sea, or from such Winds as come across it. Infomuch, that we seldom find that either Snow or Frost will abide long even in the Latitude of 55. And moreover, I have made it my Observation, that it is much easier to *winter* any tender Plant even in that Latitude near the Sea, tolerably sheltered, than in the more Southern Inland Parts of *Northamptonshire*: Which can be attributed to nothing else, but to the constant warmer Temper of the Air (in the Absence of the Sun) impregnated with Saline, nitrous, and consequently warmer Particles.

This Head of Discourse would naturally lead me to treat of some other fatal Effects of a *distemper'd Air*, accidentally very noxious, and many times fatal to all Sorts of Vegetables; such as scorching Winds, cold Dews, and Blights. But forasmuch as I intend to be a little more particular in my Directions against their Malignity and Influence, when I come to treat of the *Fruit-Garden*, I shall reserve what is to be said on this Point to a Chapter by itself.

C H A P. II.

Of E A R T H.

THIS Globe of *Earth*, on the Surface of which we live, and for which so many unreasonably strive, is compounded of many heterogenous Particles and sorts of Matter; all or most of them useful, or may be made so, for the Purposes of Vegetation: And indeed without them, no sort of Tree or Plant will continue or prosper long.

According to Mr. *Evelyn*, the various sorts of *Earth* every where to be met with are almost innumerable; especially if we include the different Colours, Weights, and Consistencies of the several Soils. However, I cannot but think, allowing something to smaller Variations in Colour and Richness, that all the different Sorts of *Earth* may be reduced to these three, *viz.* *Loam*, *Sand*, and *Clay*. For tho' there are many other Sorts, that bear other and different Names, yet they are all of them in some respect or other depending upon these; and which is more, one or other of These do every where prevail, and all of them have Parts proper for Vegetation, tho' in different Degrees and Proportions. For it must not be denied, that all the Sorts of Gravels, till you come to *Loam* itself or *Clay*, are of the *Sandy Race*: And all those binding Earths, which in any sort resemble *Chalk*, or *Clay*, or *Marle*, may be reckoned of the *Clay-kind*. The due Mixture of *Clay* and *Sand* is the Foundation of Riches in Husbandry, because either Extremes are worst. And this it is which makes *Loam* preferable to all others in its natural State, as generally consisting of a due proportion of Both. And whether this *Mother Earth*, or *Loam*, be of a black or yellow, or any other Colour, it matters not; for Experience shews that Plants of all Sorts will grow in it, as being best endued and most plentifully furnished with such proper minute terrestrial Matter as is fit to enter the Pores of Plants for their continual and gradual Encrease.

It is not to be much wondered at, that there are yet some Naturalists left, who hold that Vegetation proceeds all from *Water*; because some upon their own Experience have affirmed, that 18 Parts of *Water* out of 20 have been turned into *Earth* only by a repeated Distillation; but this rather proves that there is alway Plenty of terrestrial Matter in *Water*, sufficient to supply and augment the Plant, altho' the Manner of its Preparation for that Use be not so easy to be explained and determined.

It is the Opinion of some learned Men, that what we commonly call *Earth*, if separated from *Water* and the Parts of Animals and Vegetables, is nothing else but *Sand*, *i. e.* *Stones*; for I take *Sand* to be nothing else but small *Stones* or *Pebbles*. But it is not easy to give into this Opinion; because neither by the naked Eye, nor the Eye assisted by a Microscope, can be discovered any Likeness between the *Sand* taken out of *Clay*, and the other Matter that is left, properly enough called *Clay*; the one being glittering and nothing like it; the *Sand* sticking, as the heaviest Body, to the bottom of the *Clay*, when dissolved in *Water*, being easily rubb'd off, whilst the other by rubbing tends only to a Polish.

Altho' therefore *Sand* be a very necessary Part towards making of *Earth* fit to perform the Office of Vegetation; yet it must be in its due proportion according to the Nature of the Plant it bears, and must have another Matter with it something like to *Glew* to keep the *Sand* separate, as well as the minute terrestrial Food of the Plant (and such are all extracted Dungs from Vegetables and Animals) from presently sinking away from it. Some Plants require a lighter, some a closer Mould, according to the different Demands of Moisture. The right Knowledge of this Mixture would answer all the Ends of Enquiry, and reward us with Pleasure and Profit.

If a *Clay* mixt with *Sand*, which is an artificial *Loam*, be found out, that will bear any Sort of Grain we desire; it seems reasonable to think, that there is no Sort of natural Soil, bearing too much upon either Extremes, but may be made by discreet Mixtures fit for the same Purposes. And if the manner of Vegetation be pretty well understood, (as of late it seems to be;) and if at the same time the proper Dung or *Menstruum* for Plants can be also found; then I should think Husbandry and Gardening may be brought to the Rules of Art: And the Practice of those Rules may prove as pleasant and as profitable, as a great many other Philosophical Arts reduced to Practice are found to be.

Without

Without question, *Earth*, especially if fresh, untried or new turned, hath a certain Magnetism, by which it attracts the Nitre and Virtue of the Air and Dews, which give it Life and Motion; and tho' it is not always understood, is the Logic and Reason of all that Labour and Stir we keep about it in Tilling, to sustain us by its Encrease and Products.

It will not be necessary to dwell any longer upon this Head, or to point out the different Kinds of Earth, good and bad, as they may be distinguished by their Colours, Smell, or Texture. This will be sufficiently and occasionally done, when I come to treat about Improvements. There is hardly any so bad toward the Surface, but what by Art and Industry may be made to answer the Labour and Charge bestowed. But I cannot forbear saying here, that the best, the sweetest and the richest Kind for all Uses, but especially for the occasional Purposes of a Garden, is what I have so strongly repeated and advised *viz. Untry'd Virgin Earth*. This is an Improvement wholly unknown to the Antients, and till of late a Stranger to the Moderns. And as I have had my self the Pleasure to introduce it into the Garden, it is a great Satisfaction to me, to find the Excellence of it confirmed daily by the Experience of Others coinciding with that of my own.

Mr. *Chomel*, after he had added an Hypothesis of his own, as if a great part of the goodness of *Virgin Earth* was owing to its being *carried* from one Place to another, is forced at last to confess, "That *fresh* or *untried Earth*, is an Improvement newly introduced into Gardens, and in all appearance unknown to antient Agriculture; not even *Virgil* in his *Georgics* taking any notice thereof: However, in our Time we cannot practise the Use of it too much; for it is certain that these new Earths had not only their primitive Salt imparted to them at the Instant of the Creation; but also most part of that contained in the Surface of the Earth which sinks downward, is conveyed thither by means of Water, whose Weight made it sink down as far as it was able to penetrate. This Salt preserves itself in those concealed Earths, till coming to be a Superficies itself, the Air gives it a Disposition proper, it seems, to employ with Success the Fertility wherewith it is endued. Indeed, they are not so soon at liberty to act, as to produce Vegetables of a surprising Beauty.

I shall not say any thing further here of its Excellence and Uses, having reserved that Matter to a *Chapter* by itself.



C H A P. III.

Of F I R E.

HAVING already given an Account of some of the most remarkable Effects of *Air* and *Earth*; such as I presume may be useful to the Knowledge of most natural Operations, and particularly the Knowledge of Husbandry; I come now to say something of the Nature of *Fire* and *Heat*, and of their wonderful and surprising Effects.

Fire, or *Heat* which is a Degree of *Fire*, consists chiefly in the local Motion of the small Parts of a Body mechanically modified by certain Conditions, of which the Principal is the vehement and various Agitations of the small insensible Parts, and that *quaque-versum*. For that the *progressive* Velocity of a Body will not be sufficient to create *Heat* or *Fire*, is plainly seen from the Motion of *Air* and *Water*, which do not grow any thing the hotter for being driven on with Violence by Storms and Floods.

The Operation of *Fire* upon our Senses, the Result whereof is called *Heat*, is to be estimated by the Relation it bears to the Organs of *Feeling*. For no sort of *Body* is accounted *hot*, unless the Motion of its small Parts be rapid enough to increase or surpass the Particles of the *Sentient*, *i. e.* the Person or Part that feels it. If it be more quick in the *Object* than the *Sentient*, that Body is said to be *hot*; and if it be more languid than the *Sentient*, we say it is *cold*. This is plain by Experience; because the same Water is frequently said to be *hot* or *cold*, as the Hand that is put into it is *hotter* or *colder*.

To the Production of Heat it is requisite, not only that the small Parts be rapidly agitated, even in a much greater degree than is necessary to produce *Fluidity*; but also that the Particles thus variously and vehemently agitated be so *small*, as, generally speaking, to be singly insensible. For unless they are exceeding fine and subtile, they cannot readily penetrate the Pores of neighbouring Bodies, so as to warm or burn them. The Intensity of Heat (and the same is true of Light) is *cæteris paribus*, always as the Density of the Rays or Particles of Fire which occasion it; and that Density is as the Square of the Distance from the radiating Point reciprocally.

But it may not perhaps be unacceptable to the Reader, to be a little more particular on *Fire*; and to observe that *Heat* may be supposed to be a Sensation excited by the Vibrations of a minute Fluid, *sui generis*, which pervades all Bodies freely. For *Fire* in a Body seems to be nothing but the Action of these Vibrations on the Substances we behold. So *Smoke* are the Fumes separated from any Body by the Action of these Vibrations. *Flame* also is *Smoke* heated *red hot*, i. e. agitated violently enough to emit *Light*: And so it follows, that whatsoever attrites a Body sufficiently to excite Vibrations in this *Fluid*, heats it.

That this is a *real* Fluid, and of all others the most *minute*, may be proved from this Experiment. Place a *Thermometer* in an exhausted *Receiver*, and another in the Air. Heat the Room where they both stand; and the Spirits shall arise in *Vacuo* nearly as soon as in *that* surrounded with warm Air: And when 'tis thus risen by the Heat, remove them both to a cold Cellar, and they will both descend with equal Quickness. Again further,

All Bodies contain this active Fluid; for there is no Sort of Body but will be heated in all its Points: And which is more, all Bodies, whether *fluid* or *solid*, are expanded by Heat; and hard Bodies rubbed against each other (as I observed before) grow warm and sometimes *hot*.

Fire may, by this Motion *quaquaversum* of the Parts, be put into violent Agitation and loosened from Bodies, but not generated by it. Motion in a Right Line of a whole Body causeth no Heat, howsoever rapid, because no Vibration in the Parts among each other (nor consequently in the united Fluid) is excited. The Experiments relating to *Electricity*, which accompany the Heat which arises from *Attrition*, are most surprising, and discover some of the Properties of this Fluid.

By *Electricity*, I mean a Power which hard Bodies rubbed into Heat have of *drawing* and *repelling* minute and light Bodies. Rub two Pieces of Chrystal against each other, they will yield *Light*, but no sensible Heat; (for the Vibrations in a Body must be greater than the Heat in our Hand, or they cannot excite any new Sensation;) but *Light* shews the Presence of *Fire* as well as Heat: But to enable us to see the *Light* from *Attrition*, we must be in an unilluminated Place, as well as in a cold one to perceive the Heat. An empty Glass-Tube attrited by Woollen Cloath emits *Light*; and when this Tube is warmed by the *Attrition*, 'tis surprising how it agitates Leaf-Gold, Filings, Motes, and Threads, by repelling and attracting them at a great Distance, as they happen to coincide with or oppose the Vibration. I will not pretend to explain many Phenomena arising from this *Attrition*; or if I could, perhaps it is not proper to our present Subject.

Fire unites with Bodies in great Quantities, as well as it is loosened from Bodies. Thus in what they call the Philosophical Calcination of Quick-Silver, the Mercury placed on heated Sand covered with a Glass shall in length of Time lose its Fluidity, and become a grey Powder; the absolute Weight greatly increased, tho' the specific Gravity is lessened.

In some of Sir *Isaac Newton's* Experiments on Light, may be seen how strongly *Light* attracts and is attracted by all Bodies, but chiefly by *Sulphur*, i. e. in a Philosophical Sense, by every thing inflammable. As *Attrition* excites those Vibrations which cause *Fire*, so doth Fermentation most powerfully; Fermentation to the Eye in many Instances causing the most violent Motion every way amidst its Parts, and therefore cannot but agitate with Violence. How Fermentation causeth Motion, is hard to say; perhaps the Parts violently attract each other, and run fiercely into Contact: But on the Collision, the Parts being also elastic, fly back from the Place from whence they were drawn, into which others by Gravity were fallen, and striking against these, are again repelled; and thus the Motion encreased, encreases a most violent Vibration of the Fluid of *Fire*, which is the Cause that the Parts are often heated *red hot*, and emit luminous Fumes, that is, *Flame*; or else emit Fumes not so much heated, and therefore only *Smoke*.

Fire thus explained (whence soever it proceeds) may act in Vegetation much after the same manner it expands the Air; and makes it, by so doing, ascend and carry up with it *Films* of Water; which when thus got above-ground, and there more heated, it opens and extends the Vessels of Plants, and fits them to receive larger Supplies.

Fire may swell and join with the Fruits of the Earth, as it did in the Experiment with Quick-silver, and so may make Plants easily inflammable. And perhaps the Richness of some Fruits in Southern Countries, so much preferable to our own, may be chiefly owing to the want of a sufficient Plenty of this Nourishment; Plants being in this Sense true Fire-Eaters, and expect to be fed with Heat, as well as to have due and proper Food drawn from the Soil. But Dr. *Woodward* rightly observes, *Fire* may be in too great a proportion for some Plants, and occasion the hurrying off their Juices too fast. And therefore when the *Day* hath filled the Vessels, may we not say Plants want *Rest* by *Night*? that the Cold may condense the inward Steams, and let it drop the Vegetable Matter to nourish them.

For want of this *Rest* in long hot Seasons, it should seem that some Plants are burnt up; the Juices being hurried thro', without leaving any Refreshment behind them. And if so, the Managers of *Fire-walls* should be admonished to imitate Nature, and make some *Intermissions* of Heat. All that should be given at Night, should be only to take off the Rage and Fury of Frosts, rather to *soften* than to *heat* the Air; but then again in the Day to let them rival the Heat and Sultriness of the Climate natural to the Fruit you would introduce. Again,

Fire pulls every thing to pieces, and by that fits all *Revegetation*. It *hardens* Clay into *Bricks*, and *softens* Stone into Lime. It will by burning the Roots of Weeds, prepare their Salts (the dissoluble Parts) to be suspended by Water, and lets the other act like Ashes. It unites with the Salts of Lime, and makes them *Cautick*; and by this means in proper Soils it makes the Lime act like an artificial Sun, and thereby much accelerates the ripening of Grain, which is sometimes wanted in Northern Climes. *Fire* also itself acts as a Manure, by acting strongly on the *Sulphur* in the Earth, the Rays of the Sun heating and agitating all the minute Parts of Vegetable Matter. And accordingly it hath been experimentally found true, that when the Land hath had its due Tillage and Fallows in a hot and dry Summer, it hath extracted as much Riches from the Sun, as it gets by being manured in a wet and cold one.

In short, *Heat* much contributes to the Fluidity of Bodies, by destroying the Tenacity of the Parts, and by that Means assists Vegetation. *Heat* is retained in Bodies, after the Body which caused it is removed. But yet some Bodies retain Heat longer than others. *Sand* and *Gravel*, for Instance, longer than *Loam* or *Chalk*; *Chalk* longer than *Marle*, and *Marle* than *Clay*. From such Observations as these, with a due Regard had to a Climate guarded from sharp Winds, and out of the Neighbourhood of snowy Mountains; the Variety of Situations and their Effects on Vegetables, I am satisfied, may be much better and with greater Certainty deduced, than from a few Degrees of Latitude, or from what is commonly called a little Proximity to the Sun. Which glorious Body of Light and Fire now offers itself to be considered more particularly.

It is manifest, there is no *Heat*, but there is also some *Fire*; therefore all Heat is a Degree of Fire: Thus the Sun, being a Body of *Fire*, doth with Us all Things, and that more regularly, which a small Fire will do; for its great and necessary Use in Vegetation is sufficiently known; Heat and Moisture being what bring all Things to Maturity.

Dr. *Halley*, in the *Philosophical Transactions*, No. 203. has given us a Table of the proportionable Heat of the Sun in all Latitudes; with the Method of collecting the same: But since he estimated nothing but the bare Quantity of Rays, even without the Allowance for the weaker Impression in greater Obliquities, and without any Consideration of the great Loss of those Rays in passing through a different Length of Atmosphere at different Altitudes, it will be proper to give the Curious a new Table. This I had from my good and learned Friend, Mr. *Whiston*, long ago, when I desired him to consider this Matter, as he then did; and this, at my second Desire, he has now again improved, and gives me leave to set it down, together with his former Letter, which he has also improved. That Letter and Table here follow *verbatim*.

Dear

Dear SIR,

“ I Have considered the Problem you desired the Solution of from me, and have perused
 “ the learned Dr. *Halley's* Account of the same in the *Philosophical Transactions*,
 “ Numb. 203. And the Result of my Enquiry is this: That the Quantity of Heat de-
 “ rived from the Sun, if there were no Atmosphere to intercept any of its Rays, would
 “ be *always* as the Squares of the Sines of the Sun's Altitude above the Horizon,
 “ *i. e.* That the Quantity or Number of its Rays is still as the Sines of that Altitude;
 “ and the particular Force of each Ray, or equal Quantity of Rays, (which when more
 “ oblique are weaker, and more perpendicular are stronger) is in the same Proportion of
 “ the Sines also: Which equal Proportions, when compounded, do constitute the Propor-
 “ tion of the Squares of those Sines; and since there is an Atmosphere, will be nearly as
 “ those Numbers divided by other Numbers, expressing the Quantity of Air they pass
 “ through at every Angle of Elevation; which in the Horizon is about twelve times as
 “ much as in a vertical Situation; as Dr. *Keill* rightly states this Matter in his Astrono-
 “ mical Lectures, p. 316. Upon which Foot I have set down Tables of the Quantity of
 “ Heat derived from the Sun at Noon on the longest Day, *June 10.* At the Sun's En-
 “ trance into *Taurus* and *Virgo*, *April 10.* and *August 12.* And on the *Equinox-Days*,
 “ *March 10.* and *September 12.* for the several Latitudes from Forty Four to Fifty Six;
 “ or from the Latitude of *Montpelier* in the *South* of *France*, to that of *Edinburgh* in *Scot-*
 “ *land*; which will be sufficient for an Estimate of the *Summer* Quantity of this Heat
 “ in general for the same Latitudes, or so far as the ripening of *Summer* Fruits is con-
 “ cerned: And it will in some measure prove what you aim at, *viz.* That 'tis hardly the
 “ single Weakness of the Sun's Heat, that hinders those Fruits from ripening tolerably
 “ well in the Middle, or even somewhat *Northern* Parts of *England*, which are known to
 “ come to considerable Perfection in the *Southern* Parts of it: Since it is evident by the Ta-
 “ bles, that the Difference of an entire Degree in the *South* of *France* is not quite the
 “ Fortieth Part of the whole Solstitial Heat in *June*; but about the Thirtieth Part of
 “ the other in *April* and *August*; and no more than the Eighteenth Part, even in *March*
 “ and *September*; and in the North of *England*, the Difference of an entire Degree is no
 “ more than the Thirtieth Part of the Heat in *June*; but about the Eighteenth Part of
 “ the other in *April* and *August*, and no more than the Thirteenth Part in *March* and *Sep-*
 “ *tember.* The other Occasions of Variety of Heat in several Countries are generally ob-
 “ vious, and do not come under our present Consideration. I am, Sir, a hearty Well-
 “ wisher to your useful Designs of improving and recommending the ART of Gardening;
 “ and withal,

Your affectionate Friend and Brother,

Great Russell-Street, over-
 against Montagu House,
 Feb. 10. 1725-6.

WILL. WHISTON.

N. B. The following TABLES and CALCULATION, though they shew the real Dif-
 ference of the Sun's *Meridian* Heat in different Latitudes; yet do not account for the greater
 Number of Hours of the Sun being above the Horizon, which a *Northern* Latitude
 has more than a *Southern* one; which yet is to my present Purpose to observe. I shall
 only therefore inform the Reader in general, and by one round Number, That during all
 the *Summer* Season (the Time of ripening Fruits) betwixt the Two *Equinoxes*, there are no
 less than One Hundred Hours of Sunshine at *Durham*, more than there are at *Plymouth*, as
 might easily be shewn by a particular TABLE.

T A B L E S

TABLES of the Quantity of the Sun's Heat at Noon, when it is Vertical; at the *Summer Solstice*; the two *Equinoxes*; and the Sun's Entrance into *Taurus* and *Virgo*, for the several Latitudes from 44° to 56°. *N. B.* The Angles are made by adding the Sun's Declination to the Elevation of the *Equator*.

Degrees of Latitude.	Places Names.	Heat, June 10.	Heat, Ap. 10. and Aug. 12.	Heat, Mar. 10. and Sept. 12.
Vertical Sun.	-----	100	100	100
44	Montpelier.	83	60	37
45	-----	81	58	35
46	Lyons.	79	56	33
47	-----	77	54	31
48	Orleance.	75	52	29
49	Paris.	73	50	27
50	The Lizard.	71	49	26
51	-----	69	47	24
51 $\frac{1}{2}$	London.	68	46	23 $\frac{1}{2}$
52	-----	67	45	23
52 $\frac{1}{3}$	Yelvertoft.	66	44	22 $\frac{1}{2}$
53	-----	65	43	22
53 $\frac{1}{3}$	Lincoln.	64	42	21
54	-----	63	41	20
55	Newcastle.	62	38	19
56	Edinburgh.	60	37	18

This is what the wise Author of Nature hath contrived for us; to set that glorious Body of *Fire* at such an immense Distance from us, that it shall only *warm* and *comfort*, not *scorch* and *burn* us; as it certainly would do, were our Planet placed but as near to the Sun as *Venus* and *Mercury* are, whose Inhabitants, (for doubtless such there are) by the same

same unerring Contriver and wise Governor of the Universe, are so formed as to need and require a stronger and nearer Influence of the *Sun*. Now, that what we call *Heat* in the *Sun* is really *Fire*, is proved by such an easy and natural Demonstration, as doth in a sort bring the *Sun* nearer to us, viz. By the help of a Burning-Glass, either *Convex* in Dioptricks, or *Concave*, in Catoptricks, we collect the Rays of the *Sun* into a narrow Compass; and according to the Goodness, Dimension, and exact Polish thereof, its burning Influence is more or less immediately strong, which is felt in a small bright Point called the *Focus*; and that is nearer or further off the Glass, according to the different Dimension and Figure of the Glass.

From a late Contrivance of the great Sir *Isaac Newton*, for multiplying the Glasses, and making their several Focus's meet in one, we are made to hope for great Improvements. But it may not be amiss to relate here, by way of Illustration, what we find in the *Philosophical Transactions*, No. 360. of the several Experiments made concerning the great Power of Mr. *Vilette's* Burning Concave; which is 47 Inches wide, and ground to a Sphere of 76 Inches Radius, its Focus being about 38 Inches distant from the Vertex of the Glass. Upon Tryal it was found, that a *Diamond* weighing four Grains lost seven eights of its Weight. An *Emerald* was melted into a Substance like a *Turquoise* Stone. King *William's* Copper Half-penny melted in 20 Seconds; a *Silver Six-pence* in seven and half; *Tin* melted in three; *Cast Iron* in sixteen; *Slate* in three; *Tile* in four, and vitrified thro' in eighty; *Calculus Humanus* in two; *Talk* began to calcine in forty; a *Fossile-Shell* in seven, and *Chalk* even fled away in twenty three Seconds.

These Instances are sufficient to shew, that the *Sun* is a prodigious immense Body of *Fire*, computed to contain 227500 times the Quantity of Matter which our *Earth* contains; and tho' it is distant from us no less than 81,000,000 Miles gives *Light* and *Heat* and *Fire* in such due and regular Proportions, as abundantly answer the Purposes of human Life, and serve to aggrandize the Wisdom and Skill of the All-wise God who created all Things, and to answer the Ends of his Providence; not only in this little World of ours, but in those many other and greater in the remote Distances of the Heavens. Thus the *Heavens* declare the Glory of God, and the *Firmament* sheweth his Handy-work.

The genuine and comfortable Effect of this glorious Body of *Fire*, is *Heat* or *Warmth*; which in a due Proportion is as necessary to Vegetation, as *Air* or *Earth* or *Water*; and indeed the total Absence of any one of them is *Death*. By reason of the Weakness of the *Sun's* Rays in Winter, artificial Heats are contrived to sustain such tender Plants as will not bear the Severities of our Cold; and thus we translate the Climate of *Italy* into *England*, and naturalize almost every sort of tender Exotic, by the Help of *Fire* and *Heat* contrived by Art, to supply the Absence of the *Sun*.

Altho' it be difficult to say exactly how *Heat* operates in Vegetation; yet thus much I think is plain, that it sets in Motion the Salts of the *Earth*, and thereby prepares the Roots and Fibres of Plants to fetch in and imbibe their proper terrestrial Food. The early and cold Dews, which would otherwise chill and starve, are hereby disposed to cherish and enliven, the Branches and Leaves of Trees. And indeed, the whole Business of the Circulation of Sap and Juices is begun and continued by *Heat*, the Absence whereof must be *Stagnation*; and Stagnation of Juices in Vegetables, is the same as the Stagnation of Blood in Animals, and that is *Death*.

N. B. In speaking of *Fire* and *Heat*, I would not be thought to exclude a *Subterranean Fire*, which may with a great deal of Ease be proved to be a reality, and useful in the Growth of Plants. This drives their Sap and Juices to the Stem; and when they are there, the Heat of the *Sun* performs the rest.

C H A P. IV.

Of W A T E R.

WATER is a mixt fluid Body. That which is found in Springs, Rivers, or falls from the Clouds in Rain, is mixt with *Nitre*; and seldom or never free from earthy Particles more or less, as appears by daily Observation and Experiments: But the chief Body thereof, which constitutes the Sea and great Ocean, is always mixt with a great degree of Salt.

The Constituent Parts of this Fluid seem to be *globular* and *hollow*. If *Water* were not made up of Bubbles or round globular Parts, it could not easily be conceived to be a Fluid; for Things that have many Corners will not run upon a gentle Declivity downwards, nothing but some outward Force would carry them on; but Things that are perfectly round will not lie on a perfect smooth Place, unless exactly horizontal, without having one Part higher than another; for otherwise one Side of the round Thing will be heavier than the other, which puts all in Motion, and so successively till it meets with resistance.

If the watry Particles were not porous and hollow, Water might be as heavy as Gold; whereas Gold and Glass differ in their Specifick Gravity as *Seven* to *One*. And it is demonstrable from undoubted Experiments, that Weight is in all Bodies proportionable to the Quantity of Matter in each, there being an equal Propensity, if I may so stile it, of all Bodies whatsoever towards the Earth's Center; always sensible when the Impediment of the Medium is removed: And accordingly all Bodies descend *in vacuo*, be they they never so porous or compact in Texture, with equal Velocity. It follows therefore, that there is seven times as much Matter in Gold as in a Piece of Glass of the same Magnitude, and consequently that at least six Parts in seven in the Bulk of Glass must be Vacuity or Howness.

Another Quality of *Water* is, That it will not of itself separate from *Air*, be compressed or crowded closer in its natural State, as *Air* will. Indeed, when it is boiled it will take up near a thirtieth part of Space more than when ready to freeze: Not that it will then be compress'd by outward Force more than before; but when it grows cold, it will fall of itself, as Bubbles in boiling Water will when the Water cools.

Another Quality of *Water* is, its *Freezing*; for it will turn into Ice, which takes up more room: For altho' *hot* Water takes up more Space than *cold*, as hath been said; yet Experience shews that Ice will so swell, that a Bottle of Water not full, will be more than full when frozen, and accordingly the dilated Force will break the Bottle. What should be the true and real Cause of this Dilatation and Swelling upon extreme Cold, is not so easy to determine; only I suppose it a vulgar Error, that Ice ever *sinks* in Water: For by certain Experiments it is about an eighth Part lighter than Water, and consequently must *swim*. This Fact is made plain by dissolving a Piece of Ice in hot Water over the Fire, where it will be found to swim to the last Bit, tho' *hot* Water be much lighter than *cold*.

Some ingenious Men have thought that Nitre flying in the Air adheres to the small Bubbles of Water, and so fixes them into Hail, Snow or Ice; that the Nitre in the Form of Wedges sticks between the Bubbles of Water, and so fastens them together. This indeed (if true) would make Water take up more Space, and answer the Difficulty above: But then it would follow, that *Ice*, *Snow* and *Hail*, are plentifully impregnated with Nitre, and of consequence the *Northern* Countries should abound therewith; which yet is not confirmed by any Experience, and it is plain we have most of our Salt-Petre out of the *South*: Neither doth it appear by any Experiments in dissolving *Snow*, and boiling it away, that any Nitre remains.

If it should be asked, what Good *Snow* doth to the Earth? It may be answered, That it keeps it from external Cold, as well as the Plants which grow in it. And altho' as yet it cannot be discovered that it *conveys* any Nitre with it in falling; yet by its Porosity it may *imbibe* some, while it lieth on the Earth. The great Use of Rain and Dews to moisten and refresh the Earth, and to add to the Maturity of Vegetables, is too obvious to require any particular mention here; because indeed Nitre itself, so essentially necessary to Vegetation, cannot exert its Qualities, nor be put in Motion without it.

Another Quality, more than what I have already spoken of, is the *Volatility* of Water: But this may without difficulty be apprehended, by considering that globular Parts touch

one another but in Points, and Water having but little glutinous Matter in it, the Globes or Bubbles may be very thin and light, and so easily fly away by the least Force of Fire or Heat. For the like Reason *Spirits* fly sooner than Water, having those Qualities of Thinness and Lightness in much higher Perfection.

If it should be thought that the foregoing Definition of *Water* is too short, and therefore defective; I would add here, that when pure, it is a Fluid, not only volatile, but void of all Savour and Taste. The Reason may be, because its flexible Parts slip gently over the Tongue, and are not sharp enough to prick the Nerves and affect the Taste. But this is to be understood of *pure Water*, void of all kind of Salt, such as distilled Water is, and next, that of Rain: For the most wholesome Fountain-Water often derives something of Saltiness from the Earth. Moreover, if pure, it is also without *Smell*; for the purer any Water is, the less Smell it hath: For the Reason why the Particles do not prick the Tongue, may likewise be the Reason why they do not affect the Smell. The Flexibility and Smoothness of Water is also such, that they cannot pierce the Olfactory Nerves. Fountain-Water has indeed some Smell; but then it is a sign that such Water is not pure.

The other Part of the Definition of *Water*, is, that it probably consists of *small, hard, porous, spherical* Particles, of equal Diameters, and equal specific Gravities: That there are also between them Spaces so large, and ranged in such a manner, as to be pervious on all Sides. Their Smoothness accounts for their sliding easily over the Surface of one another; and their Sphericity keeps them from touching one another in more Points than one; and by *both* these, their Friction in sliding over each other is made very small and easy.

But because the Operation and Use of Water in the Business of Vegetation, is of some Consequence to be well understood; I purpose to set it in a Light already given us by the learned and ingenious Dr. *Woodward*, whose Experiments have been exact and regular, and his Observations drawn for them allowed to be just and rational. Both his Observations and Experiments are to be found in the *Philosophical Transactions*, No. 259. And altho' several late Writers have transcribed them for a more diffusive Knowledge; yet I think no System of Vegetables should want them: And until others of Leisure and Ingenuity shall think fit to oblige the World with more and further Experiments and Observations thereon, we may well be content with these, as founded on Reason, as well as Experience.

The Experiments and Facts of Plants set in Waters of different Natures and in different Seasons, I shall not repeat; because the Observations and Reasonings deduced from them will occasionally explain them: And those who are more curious may easily have recourse to the Treatise itself, which hath hitherto given universal Satisfaction.

OBSERVATION I. *In Plants of the same kind, the less they are in Bulk, the smaller Quantity of the fluid Mass in which they are set, is drawn off; the Dispendium of it where the Mass is of equal Thickness, being pretty nearly proportioned to the Bulk of the Plant.*

Thus the Plant in the Glass marked A that weighed 27 Grains, drew off but 2558 Grains of the Fluid; and that Plant in B that weighed 28 Ounces and a quarter, took up but 3004 Grains of the Fluid: Whereas that Plant in H that weighed 127 Grains, took up 14190 Grains of the liquid Mass. The Water seems to ascend up the Vessels of Plants much after the same manner as up a Filter: And it is no strange thing that a larger Filter should draw off more Water than a lesser one; or that a Plant that hath more and larger Vessels should take up a greater share of the Fluid in which it is set, than one that hath fewer and smaller ones can. This is not noted as a thing very considerable in itself; but chiefly in regard to what is to be offered anon, and that it may be seen that in other Collations of Things a due Allowance has been made for this Difference.

OBSERVATION II. *The much greater Part of the fluid Mass that is first drawn off and conveyed into the Plants doth not settle nor abide there, but passes thro' the Pores of them and is exhaled up into the Atmosphere.*

It is certain, that the Water in these Experiments ascended only thro' the Vessels of the Plants: The Glasses F and G, which had no Plants in them, (tho' they were disposed in the like manner as the the rest were) remained at the end of the Experiment as at first, and none of the Water was gone off: And it is as certain, that the greatest Part of it flies off from the Plant into the Atmosphere. The least Proportion of the Water expended, was to the Augmentation of the Plant as 46 or 50 to 1; and in some the Water drawn off was 100, 200, nay in one above 700 times as much as the Plant had received Addition. This so continual an Emission and Detachment of Water in so great plenty from the Parts of Plants, affords a manifest Reason, why those Countries which abound with
Trees,

Trees, and the larger Vegetables especially, should be very obnoxious to Damps, great Humidity in the Air, and more frequent Rains, than others which are more open and free.

The great Moisture in the Air was a great Annoyance to those who first settled in *America*, which then was much over-grown with Woods and Groves: But as they were burnt and destroyed, to make room for Habitations and the Culture of the Earth, the Air mended and cleared up apace, and became of a Temper much more dry and serene than before.

Nor doth this Humidity go off pure and alone; but usually carries out along with it many Parts of the same Nature, whereof the Plants thro' which it passes do consist. It is true, the *Craffer* are not so easily born up into the Atmosphere, but are usually deposited on the Surface of the Flowers, Leaves, and other Parts of the Plants. Hence are produced our Mannas, our Honeys, and other gummous Exsudations of Vegetables. But the finer and lighter the Parts are, with so much the greater ease they are sent up into the Atmosphere, and thence are conveyed to our Organs of Smelling by the Air we draw in by Respiration; and are either pleasant or offensive, beneficent or injurious to us, according to the Nature of the Plants from whence they arise.

And since these owe their Rise to the Water which ascends out of the Earth thro' the Bodies of Plants, we cannot be far to seek for the Cause why they are more numerous in the Air, and we find a greater Quantity of Odours exhaling from Vegetables in warm humid Seasons, than in any other whatever.

OBSERVATION III. *A great Part of the Terrestrial Matter that is mixt with the Water ascends up into the Plant as well as the Water.*

There was much more Terrestrial Matter, at the end of the Experiment, in the Water of the Glasses F and G that had no Plants in them, than in those that had Plants. The Garden-Mould in the Glasses K and L was considerably diminished and carried off. Nay, the Terrestrial and Vegetable Matter was born up in the Tubes filled with Sand, Cotton, &c. and in that Quantity as to be evident even to Sense. And the Bodies in the Cavities of the other Tubes, which had their lower Ends immersed in Water, wherein *Saffron*, *Cochineal*, &c. had been infused, were tinged with *yellow*, *purple*, &c.

If it may be permitted to look abroad awhile toward the Shores and Parts within the Verge of the Sea, there will be found a large Scene of Plants, that along with the *Vegetables* take up the mere *Mineral* Matter also; such as *Sea Purslains*, the several Sorts of *Algas*, *Samphires* and other Marine Plants. These contain common *Sea Salt*, which is all one with the *Fossile*, in such Plenty, as not only to be plainly distinguished on the Palate, but may be drawn forth from them in considerable Quantities; and some affirm that there are Plants found that will yield *Nitre* and other Mineral Salts.

As to *Vegetable* Matter, it is manifest how apt and how much disposed it is (being so very fine and light) to attend Water in all its Motions, and to follow it into each of its Recesses; not only from the Instances that have been alleged above, but from many others. If you percolate it with all the Care imaginable, if you filter it with never so many Filtrations, yet there will remain some Terrestrial Matter: It is true, the Fluid will be thinner every time than other, and more disengaged from the same Matter, but never *wholly* free and clear. I have filtered Water thro' several wholly free and clear Sheets of thick Paper, and after that thro' very close and fine Cloath twelve times doubled, nay have done this over and over again, and yet after all there was a considerable Quantity of this Matter discoverable in the Water.

Now if it passes thus thro' Interstices that are so very small and fine along with the Water, it is less strange it should attend it in its Passage thro' the Ducts and Vessels of Plants. It is true, that filtering and distilling of Water does intercept and make it quit some of the earthy Matter it was before impregnated with; but then that which after this continues with the Water is fine and light, and consequently such as in a peculiar manner is fit for the Growth and Nourishment of Vegetables. And this is the Case of *Rain-Water*.

The Quantity of Terrestrial Matter that it bears up into the Atmosphere is not great; but that which it doth bear up is mainly of that *light* kind of Vegetable Matter, and that too perfectly dissolved and reduced to single Corpuscles, all fit to enter the Tubules and Vessels of Plants: And upon this Account it is that *Rain-Water* is so fertile and prolific.

The Reason why in this Proposition I say, that only a *great Part* of the Terrestrial Matter that is mixt with the Water ascends up with it into the Plant is, because *all of it* cannot. The Mineral Matter is a great deal of it, not only gross and ponderous, but *scabrous* and *inflexible*, and so not disposed to enter the Pores of the Roots. And a great many

of the simple Vegetable Particles do by degrees unite and form, some of them, small Clods and *Molecules*, such as before mentioned in H, K, and L, sticking to the Extremities of the Roots of those Plants: Others of them intangle in a more loose manner, and form the *Nubeculae* and great Bodies that are commonly observed in stagnant Water. When these are thus conjoined, they are too big to enter the Pores which they might have done singly.

Those Persons who are conversant in Agriculture, will easily submit to this. They are well aware, that tho' their Earth be never so rich and good, and so fit for the Production of Corn and other Vegetables, yet unless the Parts of it be separate and loose, little will come of it. It is therefore upon this account that they bestow the Pains they do in the Culture of it, plowing, harrowing, and breaking the clodded Lumps of Earth. It is the same way that *Sea Salt*, *Nitre* and other *Salts* promote Vegetation. I am sorry I cannot subscribe to the Opinion of those learned Gentlemen, who imagine that *Nitre* is essential to Plants, and that nothing is acted in the Vegetable Kingdom without it: For by all the Trials, I have been able to make, the Thing is quite otherwise. But *this*, *Nitre* and other *Salts* certainly do; they loosen the Earth and separate the concreted Parts of it, and by that means fit and dispose them to be assumed by the Water, and carried up into the Seed or Plant for its Formation and Augment.

There is no body but must observe how apt all Sorts of *Salts* are to be wrought upon by Moisture; how easily they lique and *run* with it; and when these drawn are off, and have deserted the Lumps wherewith they were incorporated, those must moulder immediately, and fall asunder of course. The hardest Stone, if it happen, as it frequently doth, to have any Salt intermixed with the Sand of which it consists; upon being exposed to an humid Air, in a short time dissolves and crumbles all to Pieces: And much more will clodded Earth and Clay, which are not near of so compact and solid a Constitution as Stone is.

The same way likewise it is, that *Lime* is serviceable in this Affair. The Husbandman saith of it, that it does not *fatten* but only *mellow* the *Ground*: By which they mean, that it doth not contain any thing in itself that is of the same Nature with the Vegetable Mould, or afford any Matter fit for the Formation of Plants; but meerly softens and relaxes the Earth, and by that means renders it more capable of entring the Seeds and Vegetables set in it, in order to their Nourishment, than otherwise it would have been. The Properties of *Lime* are well known, and how apt it is to be put into a Ferment and Commotion by Water; nor can such Commotion ever happen when *Lime* is mixt with Earth, however hard and clodded that may be, without opening and loosening of it.

OBSERVATION IV. *The Plant is more or less nourished and augmented, in proportion as the Water in which it stands contains a greater or smaller Quantity of proper Terrestrial Matter in it.*

The Truth of this Proposition is so eminently discernable thro' the whole Process of these Trials, that I think no doubt can be made of it. The Mint in the Glass C was much of the same Bulk and Weight with those in A and B; but the Water in which that was, being *River-Water*, which was apparently more stored with Terrestrial Matter than the *Spring* or *Rain-Water*, wherein they stood, were; it had thriven to almost double the Bulk that either of them had, and with a less Expence of Water too. So, in like manner, the Mint in L, in whose Water a Quantity of good Garden-Mould had been dissolved, tho' it had the Disadvantage to be less when it was first set than either of the Mints H or I, the Water of which was the very same with that in L, but had not any of the Earth mixt with it; yet in a short time the Plant not only overtook, but much outstript those, and at the End of the Experiment was very considerably bigger and heavier than either of them.

Also the Mint in N, tho' it was less at first than that in M, being set in that *turbid thick feculent* Water that remained behind, after that wherein M was set was distilled off, had in the End more than double its original Weight and Bulk, and received above twice the additional Encrease which that in M had done, which stood in the thinner distilled Water; and, which is as considerable, had not drawn off half the Quantity of Water which that had. The Reason why, in the beginning of this Article, I limit the proportion of the Augment of the Plant to the Quantity of the proper Terrestrial Matter in the Water, is, because All, even the *Vegetable* Matter, to say nothing of the *Mineral*, is not proper for the Nourishment of every Plant.

There

There may be, and doubtless there are, *some* Parts that are much alike in different Species of Plants, and so owe their Supply to the same common Matter; but it is plain *all* cannot. And there are other Parts so differing, that it is no ways credible that they should be formed all out of the same Sort of Corpuscles. So far from it, that there want not good Indications (as we shall see by and by) that every Kind of Vegetable requires a peculiar and specific Matter for its Formation and Nourishment; yea, each Part of the same Vegetable doth so, and there are very many and different Ingredients that go to the Composition of the same individual Plant.

If therefore the Soil, wherein any Vegetable or Seed is planted, contains all or most of these Ingredients, and those in due Quantity, it will grow and thrive there, otherwise it will not. If there be not as many Sorts of Corpuscles as are requisite for the Constitution of the main and essential Parts of the Plant, it will not prosper at all. If there *be* these, and not sufficient Plenty, it will starve; and never arrive at its natural Stature: Or if there be any the less necessary and essential Corpuscles wanting, there will be some Failure in the Plant. It will be defective in *Taste*, in *Smell*, in *Colour*, or some other way. But tho' a Tract of Land may happen not to contain Matter proper for the Constitution of some one particular Kind of Plant, yet it may for several others, and those much differing among themselves. The Vegetative Particles are commixt and blended in the Earth, with all the Diversity and Variety as well as all the Uncertainty conceivable. I have given some Intimations of this elsewhere, * and shall not repeat them here; but hope in due time to put them into a much better Light than *that* they there stand in.

It is not possible to imagine how one uniform homogeneous Matter, having its Principles or organical Parts all of the same *Substance*, *Constitution*, *Magnitude*, *Figure* and *Gravity*, should ever constitute Bodies so egregiously unlike in all those Respects, as Vegetables of different Kinds are, nay even as the different Parts of the same Vegetable; that one should carry a *resinous*, another a *milky*, a third a *yellow*, a fourth a *red* Juice in its Veins: One afford a *fragrant*, another an *offensive* Smell; one be *sweet* to the Taste, another *bitter*, *acid*, *acerb*, *austere*, &c. that one should be *nourishing*, another *poisonous*; one *purging*, another *astringent*. In brief, that there should be that vast Difference in them in their several Constitutions, Makes, Properties and Effects, and yet all arise from the very same Sort of Matter, would be very strange. And so note that, by the by, this Argument makes equally strong against those, who suppose meer *Water* the Matter out of which all Bodies are formed.

The *Cataputia* in the Glass F received but very little Encrease, only three Grains and a half, all the while it stood, tho' 2501 Grains of Water were spent upon it. I will not say the Reason was, because that Water did not contain in it Matter fit and proper for the Nourishment of that peculiar and remarkable Plant. No, it may be the Water was not a proper Medium for it to grow in, and we know there are very many Plants that will not thrive in it. Too much of that Liquor in some Plants may probably hurry the Terrestrial Matter thro' their Vessels too fast, for them to arrest and lay hold of it. Be that as it will, 'tis most certain there are peculiar Soils that suit particular Plants. In *England*, *Cherries* are observed to succeed best in *Kent*; *Apples* in *Heresfordshire*; *Saffron* in *Cambridgeshire*; *Woad* in two or three of our Midland Counties; and *Teazles* in *Somersetshire*. This is an Observation that hath held in all Parts, and indeed in all Ages of the World. The most antient Writers of Husbandry took Notice of it, and are not wanting in their Rules for making choice of Soils suited to the Nature of each Kind of Vegetable they thought valuable or worth propagating.

But, which is a further Proof of what I am here endeavouring to advance, that Soil that is once proper and fit for the Production of some one Sort of Vegetable, does not *ever* continue to be so. No, in Tract of Time it loses that Property; but sooner in some Lands, and later in others. This is what All who are conversant in these Things know very well. If *Wheat*, for Example, be sown upon a Tract of Land that is proper for that Grain, the first Crop will succeed very well, and perhaps the second and the third, as long as the Ground is *in Heart*, as the Farmers speak; but in a few Years it will produce no more, if sow'd with that Corn. Some other Grain indeed it may, as *Barley*: And after *this* hath been sowed so often, that the Land can bring forth no more of the same, it may afterward yield good *Oats*; and perhaps *Pease* after them. At length it will become barren; the Vegetative Matter that at first it abounded withal being educed forth of it by those successive Crops, and most of it borne off.

Each Sort of Grain takes forth that peculiar Matter that is proper for its own Nourishment. First the *Wheat* draws off those Particles that suit the Body of that Plant, the

* *Nat. Hist. of the Earth*, p. 228.

rest lying all quiet and undisturbed the while. And when the Earth has yielded up all *them*, those that are proper for *Barley*, a different Grain, remain still behind, till the successive Crops of that Corn fetch *them* forth too: And so the *Oats* and *Pease* in their turn; till in fine *all* is carried off, and the Earth in great measure drained of that Sort of Matter.

After all which, that very Tract of Land may be brought to produce another Series of the same Vegetables; but never till it is supplied with a new Fund of Matter of like Sort with that it at first contained. This Supply is made several Ways: By the Ground's lying Fallow for some Time, till the Rain has poured down a fresh Stock upon it; or by the Tiller's Care in manuring it. And for further Evidence that this Supply is really of like Sort, we need only reflect a while upon those Manures, that are found by constant Experience best to promote Vegetation, and the Fruitfulness of the Earth. These are chiefly either Parts of *Vegetables*, or of *Animals* which indeed either derive their own Nourishment immediately from Vegetable Bodies, or from other Animals that do so. In particular, the *Blood*, *Urine*, and *Excrements* of Animals, *Shavings* of Horns and Hoofs; *Hair*, *Wool*, *Feathers*, calcined *Shells*, *Lees* of Wine and of Beer; *Ashes* of all Sorts of Vegetable Bodies, *Leaves*, *Straw*, *Roots* and *Stubble*, turned into the Earth, by Plowing, or otherwise to rot, and dissolve there: These, I say, are our best Manures; and, being Vegetable Substances, when refunded back again into the Earth, serve for the Formation of other like Bodies.

Not wholly to confine our Thoughts to the Fields; let us look a while into our Gardens, where we shall meet with still further Confirmations of the same Thing. The *Trees*, *Shrubs*, and *Herbs*, cultivated in These, after they have continued in one Station, till they have derived thence the greater Part of the Matter fit for their Augment, will decay and degenerate, unless either fresh Earth or some fit Manure be apply'd unto them. 'Tis true, they may maintain themselves there for some Time, by sending forth Roots further and further to a great Extent all round to fetch in more remote Provision; but at last, all will fail, and they must either have a fresh Supply brought to them, or they themselves be removed and transplanted to some Place better furnished with Matter for their Subsistence. And accordingly, Gardeners observe that Plants that have stood a great while in a Place, have longer Roots than usual; Part of which they cut off when they transplant them to a fresh Soil, as now not of any further Use to them.

All these Instances, to pass over a great many others that might be alleged, point forth a particular Terrestrial Matter, and not *Water*, for the Subject to which Plants owe their Encrease. Were it Water only, there would be no Need of Manures, or of transplanting them from Place to Place. The Rain falls in all Places alike: In this Field and in that indifferently: In one Side of an Orchard or Garden, as well as another: Nor could there be any Reason why a Tract of Land should yield Wheat one Year, and not the next, since the Rain, showers down alike in each.

OBSERVATION V. *Vegetables are not formed of Water, but of a certain Terrestrial Matter.*

It hath been shewn, that there is a considerable Quantity of this Matter contained both in Rain, Spring and River Water; that the much greater Part of the fluid Mass that ascends up into Plants, does not settle or abide there, but passes thro' the Pores of them, and exhales up into the Atmosphere: That a great Part of the Terrestrial Matter mixt with the Water passes up into the Plant along with it; and that the Plant is more or less augmented, in Proportion as the Water contains a greater or smaller Quantity of that Matter. From all which we may very reasonably infer, that *Earth*, and not *Water*, is the Matter that constitutes Vegetables. The Plant in E drew up into it 2501 Grains of the fluid Mass, and yet had received but three Grains and a half Encrease from all that. The Mint in L, tho' it had at first the Disadvantage to be much less than in I, yet being set in *Water* wherein *Earth* was plentifully mixt, and that in I only in Water without any such additional Earth, it had vastly out-grown the other, weighing at last 145 Grains more than *that* did, and so having gained about twice as much as *that* had. In like manner, that in K, tho' it was a great deal less when put in, than that in I, and also was impaired and offended by Insects; yet being planted in Water wherein Earth was dissolved, (whereas the Water wherein I stood had none,) it not only overtook, but considerably surpassed the other, weighing at least 29 Grains more than that in I; and yet had not expended so much Water as that by above 2400 Grains. The Plant in N, tho' at first a great deal less than that in M; yet being set in the foul crass Water, that was left in the *Still*, after that in which M was set, was drawn off, in Conclusion had gained in Weight above

above double what that in the finer and thinner Water had. The Proportion of the Augment of that Plant that throve most, was to the fluid Mass spent upon it as 1 to 46. In others it was but as 1 to 60, 100 and 200. Nay, in the *Cataputia* it was but as 1 to 714. The Mint in B took up 39 Grains of Water a day, one day with another, which was much more than the whole Weight of the Plant originally: And yet with all this it gained not one fourth of a Grain a day in Weight. Nay, that in H took up 253 Grains a day of the Fluid, which was near twice as much of its original Weight, it weighing when first set in the Water but 127 Grains; and after all, the daily Encrease of the Plant was no more than $2\frac{1}{36}$ Grains.

OBSERVATION VI. *Spring and Rain Water contain pretty near an equal Charge of Vegetable Matter; River-Water more than either of them.*

The Plants in the Glasses A B and C were at first of much the same Size and Weight. At the End of the Experiment, the Mint in A had gained 15 Grains out of 2558 Grains of *Spring-Water*; that in B 17 Grains and a half out of 3004 Grains of *Rain-Water*; but that in C had got 26 Grains out of only 2493 Grains of *River-Water*. I do not found this Proposition solely upon these Trials; having made some more, which I do not here relate, that agree well enough with these. So that the Proportion here delivered will hold for the main; but a strict and just Comparison is hardly to be expected. So far from it, that I make no doubt but the Water that falls in Rain at some times, contains a greater Share of Terrestrial Matter, than that which falls at others. A more powerful and intense Heat must needs hurry up a larger Quantity of that Matter along with the humid Vapours, that form Rain, than one more feeble and remiss ever possibly can. The Water of one Spring may flow forth with an higher Charge of this Matter, than that of another: This depending partly upon the Quickness of the Ebullition of the Water, and partly upon the Quantity of that Matter latent in the *Strata* thro' which the Fluid passes, and the greater or less Laxity of those *Strata*. For the same Reason the Water of one River may abound with it more than that of another. Nay, the same River, when much agitated and in Commotion, must bear up more of it, than when it moves with less Rapidity and Violence.

That there is a great Quantity of this Matter in Rivers, and that it contributes vastly to the ordinary Fertility of the Earth, we have an illustrious Instance in the *Nile*, the *Ganges*, and other Rivers, that yearly overflow the neighbouring Plains. Their Banks shew the fairest and largest Crops of any in the whole World: They are even loaded with the Multitude of their Productions: And those who have not seen them, will hardly be induced to believe the mighty Returns those Tracts make in comparison of Others that have not the Benefit of like Inundations.

OBSERVATION VII. *Water serves only for a Vehicle to the Terrestrial Matter which forms Vegetables, and doth not itself make any Addition unto them.*

Where the proper Terrestrial Matter is wanting, the Plant is not augmented, tho' never so much Water ascend into it. The *Cataputia* in E took up more Water than the Mint in C, and yet had grown but very little, having received only 3 Grains and a half of additional Weight; whereas the Other had received no less than 26 Grains. The Mint in I was planted in the same sort of Water as that in K was, only the latter had *Earth* dissolved in the Water; and yet that drew off 13140 Grains of the Water, gaining itself no more than 139 Grains in Weight; whereas the other took up but 10731 Grains in Weight: Consequently that spent 2409 Grains more of the Water than this in K did, and yet was not so much increased in Weight as this by 29 Grains.

The Mint in M stood in the very same Kind of Water as that in N did; but the Water in M having much less Terrestrial Matter in it than that in N had, the Plant bore up 8803 Grains of it, gaining itself only 41 Grains the while. Whereas that in N drew off no more than 4344, and yet was augmented 94 Grains. So that it spent 4459 Grains of Water more than that did; and yet was not itself so much increased in Weight as that was by 53 Grains. This is both a very fair and a very conclusive Instance; on which account it is that I make oftener use of it. Indeed they are all so: And to add any thing further on this Head, will not be needful.

'Tis evident therefore, *Water* is not the Matter that composes Vegetable Bodies; it is only the Agent that conveys that Matter to them, that introduces and distributes it to their several Parts for their Nourishment: That *Matter* is sluggish and unactive, and would lie eternally confined to its Beds of Earth, without ever advancing up into Plants, did not Water, or some like Instrument, fetch it forth and carry it unto them. That therefore there is that plentiful Provision and vast Abundance of it supplied to all Parts of the Earth,

is a Mark of a natural Providence superintending over the Globe we inhabit, and ordaining a due Dispensation of that Fluid, without the Ministry of which the noble Succession of Bodies we behold, Animals, Vegetables and Minerals, would be all at a stand.

But to keep to Plants. 'Tis manifest, Water, as well on this, as upon the other Hypothesis, is absolutely necessary in the Affair of Vegetation, and it will not succeed without it; which indeed gave occasion to the Opinion, that Water itself nourished, and was changed into Vegetable Bodies: They saw tho' these were planted in a Soil never so rich, so happy, so advantageous, nothing came of it, unless there was Water too in considerable Quantity. And it must be allowed, Vegetables will not come on or prosper where *that* is wanting: But yet what those Gentlemen inferred thence was not, we see, well grounded.

This Fluid is capacitated for the Office here assigned it, several ways. By the Figure of its Parts, which (as appears from many Experiments) is exactly and mathematically *Spherical*, their Surfaces being perfectly *polite*, and without any the least Inequalities. 'Tis evident, Corpuscles of such a Figure are easily susceptible of Motion; yea, far above any others whatever; and consequently the most capable of moving and conveying other Matter that is not so active and voluble. Then the Intervals of Bodies of that Figure are, with respect to their Bulk, of all other the largest, and so the most fitted to receive and entertain foreign Matter in them. Besides, as the Trials hitherto made, inform us, the constituent Corpuscles of Water are each singly considered absolutely solid, and do not yield to the greatest external Force. This secures their Figure against any Alteration; and the Intervals of the Corpuscles must be always alike. By the *latter* it will be ever disposed to receive Matter into it; and by the *former*, when once received, to bear it on along with it.

Water is further capacitated to be a Vehicle to this *Matter* by the Tenuity and Fineness of the Corpuscles of which it consists. We hardly know any Fluid in all Nature, except *Fire*, whose constituent Parts are so exceeding subtle and small as those of Water are. They will pass Pores and Interstices, that neither Air nor any other Fluid will. This enables them to enter the finest Tubes and Vessels of Plants, and to introduce the Terrestrial Matter, conveying it to all Parts of them; which each, by Means of Organs it is endued with to that Purpose, intercepts and assumes into itself such Particles as are suitable to its own Nature, letting the rest pass on thro' the common Ducts. Nay, we have almost every where mechanical Instances of much the same Tenor. 'Tis obvious to every one, how easily and suddenly Humidity, or the Corpuscles of Water sustained in the Air, pervade and insinuate themselves into Cords however tightly twisted, into Leather, Parchment, Vegetable Bodies, Wood, and the like. This it is that fits them for *Hygrometers*, and to measure and determine the different Quantities of Moisture in the Air, in different Places and Seasons. How freely Water passes and carries with it Terrestrial Matter, thro' *Filters*, *Colatures*, *Distillations*, hath been intimated already.

OBSERVATION VIII. *Water is not capable of performing this Office to Plants, unless assisted by a due Quantity of Heat; and this must concur, or Vegetation will not succeed.*

The Plants that were set in the Glasses, Q, R, S, &c. in *October*, and the following colder Months, had not near the Quantity of Water sent up into them, or so great an additional Encrease by much, as those that were set in *June* and *July*, and the hotter Months. 'Tis plain, Water has no Power of moving itself, or rising to the vast Height it doth in the more tall and lofty Plants; so far from this, that it doth not appear from any Discovery yet made, that even its own Fluidity consists in the intestine Motion of its Parts; whatever some, otherwise very learned and knowing Persons, may have thought. There is no need of any thing more for solving all the Phaenomena of Fluidity, than such a Figure and Disposition of the Parts as Water has. Corpuscles of that Make, and that are all absolutely Spherical, must stand so very tickly and nicely upon each other, as to be susceptible of every Impression; and tho' not perpetually in Motion, yet must be ever ready and liable to be put into it, by any the slightest Force imaginable. It is true, the Parts of Fire or Heat are not capable of moving themselves, any more than those of Water; but they are more *subtile*, *light* and *active* than those are, and so more easily put in Motion. In fine, it is evident and Matter of Fact, that *Heat* does operate upon and move the *Water* in order to its carrying on the Work of Vegetation; but how it is agitated itself, and where the Motion first begins, this is no fit Place to enquire.

That the Concurrence of Heat in this Work is really necessary, appears not only from the Experiments before us, but from all Nature: From our Fields and Forests, our Gardens and our Orchards. We see in Autumn, as the Sun's Power grows gradually less and less,

less, so its Effect on Plants is remitted, and their Vegetation slackens by little and little. Its Failure is first discernable in Trees: These are raised highest above the Earth, and require a more intense Heat to elevate the Water charged with their Nourishment to the Tops and Extremities of them; so that for want of fresh Support and Nutriment, they shed their Leaves, unless secured by a very firm and hardy Constitution indeed, as our *Ever-Greens* are. Next, the Shrubs part with theirs, and then the Herbs and lower Tribes; the Heat being at length not sufficient to supply even these, tho' so near the Earth the Fund of their Nourishment. As the *Heat* returns the succeeding Spring, they all recruit again, and are furnished with fresh Supplies and Verdure. But first those which are lowest and nearest the Earth, *Herbs*, and they that require a less Degree of Heat to raise the Water with its earthy Charge into them: Then the *Shrubs* and higher Vegetables in their turns; and lastly, the *Trees*. As the Heat increases it grows too powerful, and hurries the Matter with too great Rapidity thro' the finer and more tender Plants. These therefore go off and decay; and others that are more hardy and vigorous, and require a greater Share of Heat, succeed in their Order. By which Mechanism, provident Nature furnishes us with a very various and differing Entertainment, and what is best suited to each Season all the Year round.

As the Heat of the several Seasons affords us a different Face of Things, so the several distant Climates shew different Scenes of Nature and Productions of the Earth. The hotter Countries yield ordinarily the largest and tallest Trees, and those too in much greater Variety than the colder ever do. Even those Plants, which are common to Both, attain to a much greater Bulk in the *Southern* than in the *Northern* Clime. Nay, there are some Regions so *bleak* and *chill*, that they raise no Vegetables at all to any considerable Size. This we learn from *Greenland*, from *Island*, and other Places of like cold Site and Condition. In these no *Tree* ever appears, and the very *Shrubs* they afford are *few*, *little* and *low*.

Thus far this great Philosopher and ingenious Author, Dr. *Woodward*; who, in explaining the Nature of Vegetation, has perhaps said more, at least more to the Purpose, in that small Treatise, than is to be found in all the voluminous Authors on that Subject, not excepting Mr. *Evelyn* himself. I was willing therefore here to recite his Observations and Reasonings, even as they now present themselves to the World; hoping yet, some time or other, that superior Genius will, as his Affairs may suffer, oblige the World with some further Enlargement on the Subject, as the Doctor has been so good as to make me hope he will, in a late Letter to my self.

In the mean Time, altho' it is a very undesirable Thing to differ in Sentiment from so good a Reasoner and nice Observer of Vegetable Nature; yet I know the Doctor's Goodness will excuse me, if I am forced to say, I cannot altogether *give in* to some Parts of the foregoing Propositions, at least as they stand there explained.

IN OBSERVATION III. where a Reason is given why only a *great Part* of the Terrestrial Matter ascends up into the Plant, and that *all of it* cannot, because he thinks the *Mineral* Matter not only too *gross* and *ponderous*, but *scabrous* and *inflexible*; he proceeds further on to illustrate this, by explaining the Nature of *Lime*, viz. that it doth not *soften*, but only *mellow* the Ground; containing nothing in itself of the same Nature with the Vegetable Mould, or affording any Matter fit for the Formation of Plants, but merely *softens* and *relaxes* the Earth.

It is indeed the Nature of *Lime*, when it is first *slacked*, to open and relax whatever it is mixt with; but it is well known, that that sudden Power of Relaxation is soon over, and presently obtains a quite contrary Quality of *binding* and *contracting* every thing it is mixt with, to itself. And indeed, the Art and Practice of the Husbandman is founded upon this very Principle and Reason, that the mixing Things of the most contrary Natures, and which most cause *Relaxation*, is the Life of Vegetation. Accordingly they never chuse *Lime* for Clays; which are the Soils, if any, that want Opening and Relaxation. So far from that, that they reckon (at least after a Year or two) it doth more harm than good, by *saddening* and making the Soil more *untractable*. The Soils, where *Lime* is justly and with reason esteemed a proper and suitable Manure, are *sandy*, *gravelly*, or other *light* mixt and mellow Soils; such as do not want *Opening* and *Relaxation*; but, on the contrary, want *Tenacity*, and to be made *heavier* and more *binding*.

For the same purpose also are used *Chalk* and *Marle*, not to *loosen*, but to *sadden* the Soil and hold it together, that the Rain may not sink too soon away, nor be too soon exhausted by the Heat of the Sun. Accordingly *These* also are by Experience found in a wonderful manner to answer the Husbandman's Hopes, by a long and continued Enrichment of the Soil discreetly chosen; even of such Soils as have not wanted Opening and Relaxation, (having

(having been of themselves rather too light,) but were become *steril* and destitute of a proper nutritive Matter fit for Vegetation.

These Observations, founded upon Practice and Experience, I think, demonstratively prove something *more* and *other* than what the Doctor is willing to allow to the Power and Force of *Lime*. That *Lime* is a *Manure*, and an excellent one too, laid on a proper Soil, we are both agreed; but we differ as to the Effects of its Operation. And if the Doctor had not too strictly confined himself to an Opinion, that nothing but *Vegetable* Substances, refunded back again into the Earth, are proper Manures, and serve for the Formation of other like Bodies, his Doctrine in the main would have stood perfectly right; only by allowing that the Ashes or Salts of *Minerals*, or the Minute and Terrestrial Parts of *Mineral Bodies*, are also a proper Food for Vegetables.

This Supposition will appear more rational and probable, by what I shall say in the Sequel of another Observation I have to make on what the Doctor hath been pleased to say toward the End of his last Proposition, with respect to the Effects of *Heat*, viz *That those Plants which are common to both hot and cold Countries, attain to a much greater Bulk in the Southern than in the Northern Clime*. This, I doubt, will be found to be indefensible, as carrying the Virtue and Power of *Heat* beyond its Strength, and further than Experience will confirm. We do not find, for Instance, that the *Oak* and *Ash* and *Elm* (Trees common to both hot and cold Countries) do observe any such Proportion. So far from that, that the Stature and Bulk of an *English Oak* especially, (such as I have mentioned under the Article of *Forest-Trees*) is justly surprising, and not to be paralleled in hotter Countries. As far as my Observation has gone in this Matter, the Productions of Nature in the Growth and Increase of Trees are commonly answerable, (not to the *Heat* and *Cold* of Climates, but) to the *Situation* and *Soil* wherein they are planted, agreeable to the Nature and Constitution of each respective Tree.

We need not go further for a Proof of this than *Scotland* or *Norway*, where the *Firs* of all Kinds are known to prosper to admiration; and accordingly from thence are fetched the *best*, the *most*, and the *largest* Trees. *Firs* will grow in *Italy* and *Spain*, and there make fine and handsome Trees, if the Soil and Situation be suited to their Nature; otherwise they soon become dwarfish and stunted in their Growth, and discover many Indications of their Dislike and ill Health: And even at the best, and under the most desirable Circumstances of a well-chosen Place, they are far from being able to vye with the Productions of the *North*, either as to the Goodness or Largeness of the Timber. The Reason of all which I take to be this; that *too much Heat in many Cases is as injurious to Vegetation as too much Cold*.

As to Trees and Plants that bear Fruit, there may be some Shew of Reason to support the Doctors Observation; because the Heat of the Sun and Clime is, in the general, so necessary for the ripening the best Fruits, and bringing them to Perfection: But even here (if it be rightly considered) the Proposition will not hold as to the *Bulk* of Trees common to both *North* and *South*. I cannot call *Vines*, *Peaches*, *Figs*, &c. Plants common to *both*; for they are of a *Southern* Original and Extraction, and are nursed here with Care and Art, that we may be rewarded with their Fruits, which want their native Sun: But the Trees and Plants themselves (tho' Foreigners) do not even discover any Want of Heat to explain their Productions. However, the Comparison ought to be made of Fruit-Trees that are plainly common to *both* Climates; such as are *Pears*, *Apples*, *Plums*, &c. and *these* are not observed to grow bigger in *Italy* or *Spain* than in *England*; but rather the contrary, from the Reason above.

But to return to the Productions of Nature in Forest-Trees. It is almost unaccountable how *Elms* and *Ashes* in *England*, and *Firs* in *Scotland* and *Norway*, will grow; and to what a Bulk and Height they will arrive, even on *barren Rocks*, where their Roots are observed to extend themselves, and to find out their difficult Passage thro' the narrow Clefts and Crevices thereof, to fetch Nourishment for their Augment and Support. It cannot well be imagined, that here is ordinarily to be found *common Terrestrial* Matter sufficient for such large Productions. The opening such Rocks, and following the Meanders and Windings of such Roots and Fibres, discover little Foundation for such a Supposition. I can therefore see no Reason to hinder the Belief, that such Trees fetch their Support and derive their Nourishment from *Mineral* Matter; from such Exsudations, Salts, and minute Parts of *Minerals*, as are proper to be conveyed by the Help of Water thro' the Vessels of Plants.

I shall always be willing to be set right by any superiour Genius: But by what I have observed and said above of the Natures of *Lime*, *Marle* and *Chalk*, and have here remarked concerning *Ashes*, *Elms* and *Firs*, growing on barren Rocks; I am inclined to think that the Ashes or minute Parts of some *Minerals* unformed, are equally serviceable for Vegetation

tion with the minute Parts of Terrestrial Matter fetched from Vegetables. As to the Objection, that Mineral Matter is too ponderous and inflexible to be conveyed thro' the Vessels of Plants; *that* may be of some Force with respect to the heavier and harder Sorts, as Iron, Lead, Copper, &c. but can be of little with respect to *Stone, Marle and Chalk* pulverized; which need not be imagined more *angular* or unfit to enter the Pores of Plants, than Terrestrial Matter itself.

Thus far I have thought fit to remark, to clear up a little further the Vegetable System; but yet with great Submission and Respect to Dr. Woodward's second Thoughts. However, in the mean time, I would have it be observed here, That the Doctor's main Propositions and Reasonings thereupon stand yet firm and unshaken, *viz.* That a great Part of the Terrestrial Matter mixt with the Water, ascends up into a Plant as well as the Water: That a Plant is more or less nourished, in proportion as the Water in which it stands contains a greater or smaller Quantity of Terrestrial Matter: And therefore, That Terrestrial Matter, not Water, is the Subject to which Plants owe their Increase: But yet, That both Water and Heat are absolutely necessary to put all in Motion for the purpose of Vegetation: And finally, That even Nitre itself is no otherwise essential to Plants, but only to loosen and separate the Parts of Earth, so as to dispose them to be carried into the Seed or Plant for its Formation and Increase.

But this being a Matter hitherto *tenderly* touched, talked of by all Writers only in Generals and ambiguous Expressions; and wherein I own my self to have some Doubts, and to be yet not perfectly clear; I was willing to have the Opinion and Philosophical Reasonings of an ingenious and learned Friend, who needs no other Encomium but his own Reasonings.

And because he has been so good as to suffer me to make use of his Sentiments, I shall here lay them before the Reader, as they were kindly communicated to me in his Letter, which came to me after I had shewn him the Remarks above; and I think they do not need the modest Apology he made.

Dear SIR,

I Have read your Observations on Dr. Woodward, and am pleased to observe, that the Difference between you in the grand Point; is, like most other Disputes, chiefly *Verbal*. If you mean by *Mineral* Matter, only Matter contained in the Bowels of the Earth, that never had been Parts of Plants; I readily agree, that vast Quantities of such are mixt in the Earth, and with the grossest Minerals, fit to assimilate themselves with Vegetables; nay, that perhaps Metals and Stones are not free from them; but when their Fumes are drawn off by Fire, these may perhaps be found to contain no small Quantities. All *Marles* and *Chalks* abound with them; and every Thing which the Rain can penetrate will be repleted with these Particles. But then these Particles are as distinct in their Nature from Stone, or any Mineral Substance, as Gold is from Chrystal, or the two most opposite Things which are lodged in the Earth; and they differ no more from the Parts of Plants, than new Bricks fit for Building do from those which were once united in the Form of an House. Your Argument to prove your Proposition, from the vast Bulk to which Trees will grow on Rocks and barren Places only; I think makes it evident, that they receive their Nourishment not from the Soil that supports them, but from the *Vegetable* Substance with which the Dews and Rains are repleted. Thus the * *Sedum arborescens* will grow to a large Bulk, and flourish like a Camellion on the *Luxury* of the Air; for when tied up in a String, it extends its Roots to suck the fattening Moisture from far, and supports its bulky Leaves in Vigour on that *thin* Diet. So your † Vine, which from the Crevices of a Castle-Wall poured forth yearly a Vintage, gave only what the floating Moisture, with the Vegetable Materials suspended in it, enriched it with. And I shall constantly believe this, till some Experiments shew that the small Particles of any Mineral can be drawn from Plants by a chymical Analysis, excepting perhaps Sulphur, whose Parts are so thin and volatile, that they may be carried up, and unite with the Parts of Plants, and be retained in Fruits.

If Gold was suspended invisibly in *Aqua regia*, and any proper Precipitate in Ramifications was extended thro' the Fluid to collect the flying Gold, and gather it again into a visible Mass, it would represent my Sentiments exactly: For you see, that in this Case nothing but Gold would be united with this Kind of Vegetation; so nothing but the

* Most bulbous rooted Plants will do the same, *viz.* Onions, Tulips, Tuberoſe, &c.

† See Clergyman's Recreation.

“ Substance of the Plant-Materials in the other. But I think this is only a Dispute about
 “ Words ; what you call *Mineral* Substance, we more intelligibly, and I think more rea-
 “ sonably, contend is the same Sort of Substance with the Plants, lodged with the Mine-
 “ rals.

“ As to another Point indeed, I differ from you *toto cælo* : Fermentation is not only *not*
 “ the Life of Vegetables, but it is the sure unavoidable Death of them. Fermentation is
 “ that which will disunite the Parts, and separate them from each other ; and when that
 “ Separation is performed, then indeed they are fit to be put together again : As when
 “ you pull to pieces an old House, the Materials are fit to be employed again ; but the
 “ pulling down is not the Life of Architecture. The Heat which Fermentation causes
 “ indeed, will act and assist in Vegetation like all other Heat ; and if that Heat sends forth
 “ Steams of well disunited Particles, it will enrich the Earth thro’ which it percolates
 “ with proper Materials and Food for Plants ; but whilst the Fermentation continues, and
 “ in the Place where it actually is, Plants would be absolutely destroyed by its violent
 “ Motion.

“ You mention the mingling of Contraries as the presumptive Cause of Fermentation.
 “ What the Cause of that surprising Power is, I am as ignorant as I am what is the Cause of
 “ Gravity or Elasticity : Neither *Friend* nor any other satisfy me : But that Things being
 “ merely contrary to each other causes *not always* Fermentation, is most evident ; and
 “ that Things which are by no means contrary to each other will ferment, is every day’s
 “ Experience. This Philosophical Age therefore will not relish the common Expressions
 “ of *contrary Things raising a Bustle and Ferment* ; because *these* give no clear Ideas of any
 “ efficient Cause to the Mind which satisfieth. Fermentation is properly the Life (as I
 “ may call it so) of one of the Three old Principles which the Followers of *Aristotle* said
 “ went to the Composition of all Things ; *Materia, Forma & Privatio*. The *Last* indeed
 “ is almost wholly owing to it ; Bodies not often putting off one Form to assume a se-
 “ cond, but by its Assistance.

“ I must confess, I think you in the right to question that Fact, *That Vegetables com-*
 “ *mon to all Climates are better always in hot than cold Countries* ; if it is true, that any
 “ Plants may be said to be naturally common to very distant Climates : And my Reason
 “ for it is this, That the vast Heat may make in some such a large Perspiration and
 “ Hurry of Juices ; which, tho’ they can *live under*, they cannot *thrive with*. But I
 “ doubt whether all Plants, tho’ they will support every Degree of Heat, want not a
 “ *certain one* to attain their Perfection : Tho’ it must be owned that many Plants, as
 “ *Wheat*, &c. are vastly plumper and whiter in *Southern* than *Northern* Harvests, and the
 “ Taste of others (as *Onions*) more luscious, and the Size more large.

“ As to your Instances, two Things must be observed : That *Firs* of *Southern* Moun-
 “ tains and the *Northern* are not Trees of the same Kind, tho’ the same Name ; the *Silver*
 “ and *Spruce* greatly differing : That the Climates in Heat do not differ so much, as in
 “ Denomination ; for eternal Snows cover the Brows of the *Alps*, where *Firs* flourish to
 “ a most gigantick Size, as well as the Hills of *Norweigh*.

“ To come now to the grand Point, the Nature and Force of *Lime*. But how shall
 “ we determine this Dispute, when we do not agree in the *Facts* ? You say, that *Lime* is
 “ not proper for Clay-Land, according to your Hypothesis ; *Woodward* saith, it is not
 “ proper for Sand and light Soils, according to his Hypothesis : But Farmers shake their
 “ Heads at you *Both*, and constantly employ it in *both* Kinds in this very Country ; but
 “ in *Devonshire* mostly in Clay-Soils, Sand and Lime being judged proper Manures for the
 “ same Land. *Lime* is nothing but Stone burnt in Fire to a very great Degree, thorough-
 “ ly sated with the Flames in which it had so long lain. *Water* breaks the Parts of the
 “ Stone, which hung but tenderly together, and suffers the Fire by that means to meet
 “ and unite. The Activity of the *Lime* is owing to the actual Fire ; and the Parts of the
 “ Stone act like other hard yet spongy Substances, as an Absorbent : It is known to
 “ *tear* every Thing to pieces it is mingled with at first ; but the minute Parts of the
 “ *Lime*, when the Fire is separated from them, have so strong an Attraction, as to unite
 “ together again as soon as the Moisture by its own Heat and Time is avaporated, and
 “ enclose any Thing that is mingled with it, unless it is joined in so large a Quantity as
 “ to keep the Parts at too great a Distance that they cannot join to each other ; and by
 “ that means their uniting with the Materials nearest them destroys the Union which be-
 “ fore was between the Parts of Clay itself, and consequently *crumble* it.

“ Thus you see, Sir, how possible it is, for the same Thing to form Mortar, mixt with
 “ a little Sand ; to crumble Clay, when a little of it is joined to a great Quantity of the
 “ sticky Soil ; and to bind the sandy Soil, by making an Union between Parts where there

“ was

“ was none before. When it crumbles Clay; it by that means suffers the Rain with its
 “ Riches to penetrate every Part, and makes way for the tender Fibres to follow after
 “ it.

“ You rightly explain the Benefit sandy Soil receives from it, by hindering the Wa-
 “ ter from running thro’ it, without lodging its proper Sediment amongst it; to stiffen
 “ it to support Plants; and such like good Effects. Besides these Benefits from *Lime*,
 “ many others belong to it. Its Heat may assist Vegetation in all Kinds of Land great-
 “ ly. Heat may remain enough to actuate Steams, tho’ it is lower in Degree than to affect
 “ our Senses. Fire will not leave the Stone Particles, to which it was so intimately united,
 “ intirely, probably for ever. And if Fire (for Fire is not meerly a Quality common to
 “ all Substances, but a Fluid of its own Kind) is there, its active Virtue will be there
 “ also.

“ As to *Marle*, the Virtues are as various as its Kinds. Some contains prodigious Quan-
 “ tities of Vegetable Matter which it gained from Rain, which Age after Age penetrated
 “ it; which immediately on becoming dry would admit no Vegetable to enter and rob it
 “ of the Treasure: Some of it, when constantly exposed to Air and Rain, and crumbled
 “ amidst Earth, turns to a softer Sand: Some contains very oily Particles mixt with Salts,
 “ (as *Fullers Earth*;) Some contains Fire also, as *Chalk*; for I have known a Beam fixed
 “ in Chalk burnt to a Coal, as if placed in unextinguished Cinders. Thus, Sir, you see
 “ how *these* may, by discreet Use, be capable of improving most amazingly all Kinds of
 “ Soils. I have tired you with this long and hasty Answer. But I am so satisfied with
 “ what I have said about *Lime*, that I am perswaded a very great Light may be thrown
 “ on the Whole of Husbandry from these Principles, drawn out at length and explained;
 “ for there is nothing but what is most agreeable to Experience and true Philosophy; it
 “ is clear and satisfactory to the Mind, and useful in Practice: And *Lime* thus explained
 “ acts in *Surgery*, in *Medicine*, and *Husbandry*, by the same Principles. Use the Principles
 “ in this Letter as you please; the Letter itself is writ in too great a Hurry to be re-
 “ garded by any but one who is willing to pardon all Faults in his

Affectionate Friend.

P. S. “ I can hardly forbear explaining more at large the Nature of *Lime*; and shew
 “ you, that its Composition is a *fixed Salt*, and an absorbent *Earth*, and *Fire* both united
 “ to and enclosed between the Parts of the other two; and convince you that it is possi-
 “ ble, nay, that it must necessarily perform All I have attributed to it; and consequently
 “ shew how it becomes so excellent a Manure. But it is too long to undertake in such a
 “ manner, as to deduce it from the first Principles of genuine Philosophy, without know-
 “ ing whether it will be useful to you, which alone can make it acceptable. Only this
 “ easy Experiment carefully tried would convince the most obstinate. Take 50 Pound
 “ Weight of sticky Clay, and mingle with it 8 Pound Weight of powdered Quick-
 “ Lime, with a due Quantity of Water to make them incorporate: Beat these together
 “ in a paved Court, exposed to the Weather; Mortar will not be made by it, but the
 “ Clay will become disunited, loose, and crumble, and continue so, till Rain passing thro’
 “ it drains away all the Lime. At the same time, in another Part of the Court, mingle
 “ the same Weight of Lime with the same Quantity of *sandy loose* Soil, 8 with 50; stir
 “ them together with Water, and you’ll find the Sand clot and grow more connected,
 “ and become a firmer Soil by it. And such contrary Phenomena being explained by the
 “ same Principles, give a great Sanction and Authority to the Principles themselves.

The ANSWER to the foregoing LETTER.

Dear SIR,

“ **Y**OU are extremely good in so freely communicating your Thoughts to one, who
 “ always sets so high a Value upon them. You have acted the Part of a right Me-
 “ diator betwixt Dr. *Woodward* and my self, in your Explanation of *Mineral* Matter.
 “ Only I am apt to think (and we can but guess) that there are, besides Terrestrial Mat-
 “ ter, among the barren Rocks, and amidst the deep Crevices of bulky Stones, some such
 “ Exudations and unformed Mineral Matter, (for that Minerals grow I do not in the least
 “ doubt) as unite themselves to the fibrous Roots of Plants and Trees for their Support,
 “ and otherwise unaccountable Magnitude.

“ When I say *sometimes*, and in some Cases, that Fermentation is the *Life* and *Cause* of
 “ Vegetation, and *always* that it is a great *Help* to it; it is to be understood of a Fermen-
 “ tation already performed, or of such an one as supplies the Defect of natural Heat.

“ There

“ There is an immediate Cause, a remote Cause, an efficient Cause, and a *Causa sine qua non*. And this last is the Cause I had in my Eye, and is a true one.

“ I shall not at present (Time will not suffer me) say any thing against your ingenious philosophical Reasoning about the Nature and Operations of Lime: Philosophy is very pretty; but never to be depended upon, till confirmed, or not contradicted, by Experience and Facts. The Ambiguity of the Word *Clay* led your Farmers to smile, and your self to think that Lime was proper Manure for all Clays; whereas there is almost as much Difference betwixt one Clay and another, as there is betwixt Gravel and Clay. Some Clays are of that easy tractable Nature, that they will of themselves *fall* asunder (when turned up) with Rain and Weather; and such are much mended with Lime: But there are others (and those the most frequent) of that stiff, sour, wet, untractable Nature, that nothing but Sand, Coal, Ashes, &c. will separate their Parts, at least that will leave any abiding Effects.

“ I could shew you, even in my own Parish here, the melancholly Sight of many Acres of Ground quite ruined and spoiled by *Lime*; so that with all the laborious Diligence of applying seasonable and sufficient Quantities of Lime, it would bear no Corn, and now it is laid down, it will hardly bear a Spire of Grass; insomuch, that it is not to be recovered, but by a long Course of better Husbandry of Sea-Sand and Coal-Ashes, &c. which has begun already to restore some Parts, and to expel the Poison.

“ I have had Thirty Years Experience of these Things; and am so sure that my Facts are right, that tho’ I love Reasoning should go along with Experience, yet when the *Former* is separated from the *Latter*, I shall believe that Lime is *bad* for stiff untractable Clays. What Farmers often call Clays, are either more properly *loamy Soils*, where the Clay lieth twelve or fourteen Inches under the Surface, or else are inclinable to *Marle* or *Chalk*; *both* which easily *fall*, and when worn out, are mended with Lime.

“ Not but that, by such an Experiment as you mention, even the worst of Clays, by tampering them with a Quantity of *quick* Lime, may be opened, and their Parts loosened for the present by the active Parts of new Lime; but those *active* Parts soon, too soon, become *passive*, and are in Time meer *dead* Lumps of Earth, cold, heavy, stiff, and untractable.

“ And the very same Effects must be expected from Clay Land, where the Superinductions of Lime have been considerable, and frequently repeated; it will every Year grow worse and worse, till even the *active* Parts of Fire and Salt in the Lime will do it no good, but leave it a sterile unactive Lump, fit for nothing but to hold Water like a *Bason*. When I receive the Favour of your next, possibly I may have an Opportunity to say something further on this Point. In the mean Time, I am,

Dear S I R,

Yours affectionately,

J. L A U R E N C E.

The A N S W E R.

Dear S I R,

“ **A**S to the Dispute between us, I still continue of the same Opinion: If you mean by Exsudations of unformed Mineral Matter amongst Rocks, nothing but that Vegetable Matter which may be brought up thro’ the Crevices and Cracks with the ascending Steams, which internal Heat sublimes, I will not deny the Probability: But then I would not chuse to express the true Idea by Words, which all philosophical People will imagine convey the contrary Opinion; but would call every thing which is capable to be carried into the Vessels of Plants by Water to encrease their Bulk, *Vegetable Substance*, or *Salts*; meaning by *Salts*, what the Chymists do, every thing easily dissoluble in Water, till it is dispersed thro’ it, and becomes invisible. And then, whether these were originally lodged in the Interstices of Rocks, or brought up thither by Fumes arising from the Heat in the Bowels of the Earth; or whether mingled with Loam, Sand, Clay, or any other Substance at first; or by the Corruption of old *Vegetables* or *Animals*, (which by feeding on them are of the same Nature,) are returned to these again from whence they were drawn; it is all one: If there, they will encrease the Bulk of the Plants; and without it, the Plants can never thrive.

“ As

“ As to Fermentation, I am glad we so far agree, that it is only necessary to prepare
 “ the Materials for Vegetation, or sometimes by its Heat supply the Absence of other
 “ Warmth: And if we agree in the Thing, methinks we should agree in the Expressions
 “ also, that People may not be led into Mistakes about it. The *Causa sine qua non*'s are
 “ quite out of Fashion, and seldom come into the Heads of any who are unacquainted with
 “ School-Philosophy; and for the Admirers of that Philosophy; you scorn to write.
 “ Fermentation assists, perhaps wholly causes, Corruption; and consequently, by sepa-
 “ rating the Parts, makes them proper to be again suspended in Water; and perco-
 “ late thro' the fine Strainers of the Roots: If the Fermentation hath not produced its
 “ perfect Work, and yet the Mass is forced by more than common Heat, which relaxes
 “ and dilates the slender Channels or Tubes of the Vegetables to pass into them, they
 “ flourish with a sickly Vigour, lose their own proper Flavour, and taste of the very Com-
 “ posts out of which they grew; witness the *Asparagus* on Hot-Beds, and the Dung which
 “ gives a Taint to all the Plants which are *compelled* to grow in it.

“ Fermentation therefore is highly necessary to reduce into the original Particles the old
 “ waste decaying Vegetables, and to prepare the Materials to be employed a second Time
 “ to build up Plants. Fermentation may assist also to break and crumble the Clods of
 “ Earth, to let the Rain and Fibres of Plants penetrate them to suck up the fattening
 “ Moisture.

“ I again confess, that I am ignorant of the Cause of this great Power, whose Effects
 “ are astonishing, as much as I am of *Elasticity* or *Attraction*; tho' perhaps it is nothing
 “ but a Modification of those Two conjoined, acting on and exciting the Fluid of Fire,
 “ which pervades and is contain'd in every Mass. *Friend* and his Followers are unsatisfa-
 “ ctorily ingenious in their Attempts to deduce it from those two Principles, without
 “ taking in this Fluid. The Attraction of the small Particles is the Cause of Cohesion;
 “ this Fluid of Dissolution, when it is so moved that its Expansion overcomes the Power
 “ of the other.

“ Now for *Lime*, where I still think I am right, and can account for every Fact you
 “ mention from my Principles, I have since talk'd with most notable Farmers, who con-
 “ firm what you observe, and yet agree with me. No Clay (say they) is so stiff and
 “ sour, but it will grow tender and mellow by Lime; but after three or four Years,
 “ the Tenderness will go off; and if you lay it down with the Lime, it will be harder
 “ than ever, and nothing will grow on it. This is the very Thing I should expect:
 “ Lime by joining its fixt Mineral Salts with Particles of the Clay, disunites them from
 “ each other, and gives leave for Rain to mix with it, and dissolve and suspend all the Ve-
 “ getable Matter which was imprisoned in its Bowels: But by Time, the Rains carrying
 “ away the Parts of Lime, which had thus separated the Clay, the Parts of Clay more
 “ strongly unite, by having all the Mixture of Loam and Vegetable Substance robb'd from
 “ it, and thus becomes harder and stiffer than before, and nothing can penetrate its Parts, or
 “ if it could, a single Blade of Grass must be starved there.

“ But if while the Lime had thus broken the Union of the Parts of the Clay, Sand
 “ and Coal-Ashes and Parts of old Bricks or Manure, as Rags, (which acts the two Parts
 “ in Improvements,) or any Vegetable Substance, was mingled to keep it hollow and en-
 “ rich it, then the Rain and Dew would have continually brought new Treasures to it,
 “ and made it excellent Soil. Thus then in stiff Clay, a proper Mixture of Lime, at first
 “ breaking up, will be highly beneficial; but it will ruin the Land, if laid down again
 “ without some other Aid and Assistance. This Philosophy teacheth, and Experience con-
 “ firms. *Lime* also assists in dissolving Dung and Vegetable Substances the sooner; so Un-
 “ dertakers mingle it in large Quantities in Cossins to destroy and rot the Bodies. So far
 “ for Husbandry. I offer these Thoughts to your Consideration, because I desire that your
 “ Work should give no Offence to the Philosophical Gentlemen, who will expect from
 “ you not *Facts* only, but the *Reasons* of the *Facts*, in a clear intelligible Manner, support-
 “ ed by the best and uncontestable Principles of the best and genuine Philosophy. People
 “ will expect the acute Philosopher, as well as the experienced Husbandman, from one
 “ of your Character. I add no further, but an Assurance that I am

Your most Affectionate, &c.

The ANSWER.

Dear SIR,

" I Think most of our seeming Differences are adjusted, except about the Powers and
 " Effects of *Lime*; in which I cannot be clear, but by adhering to what I first laid
 " down as a Maxim supported by Experience, and no way contrary to Reason or true
 " Philosophy, That *Lime* tho' it be *good* for light Soils, is *bad* for binding Clays; because
 " tho' Quick Lime hath by its *Fire* and *Salts* the Power of Relaxation, yet forasmuch as
 " it soon obtains (agreeably to your own Principles) a quite contrary Quality of binding
 " and contracting every thing it is mixt with to itself, till by repeated Superinductions the
 " Soil becomes fit for neither Tillage nor Pasture, it must be look'd upon by the Hus-
 " bandman as Poison to his Clays. And there is this demonstrative Reason to be given,
 " that it is Poison *there*, or (which is the same Thing) leaves poisonous Effects; because
 " Land thus spoilt by *Lime*, can neither be recovered, nor made to answer in Tillage, by con-
 " tinuing it even in the greatest Plenty; which plainly shews, that there are such stiff, cold
 " untractable Soils, which the Power of Lime can neither *mend* nor *cure*.

" After all, perhaps there is not a great deal of Difference between us. You own that
 " Clays should be open'd and mended, with Sand, Coal-Ashes, Rags, &c. before they are
 " laid down from *Lime*, to prevent and remedy its *contracting* Qualities and *binding* Effects:
 " I say, the best way is to keep the *Disease* far off, that there may be no Occasion for a
 " Cure, which cannot be perfected but by a long and tedious Course of Physick, and to
 " keep to such wholesome Diet and proper Manures as want none.

" However, what I have learnt from your instructive Observations and philosophical
 " Reasonings, is to me a Treasure, which I shall always value; and will at the same Time
 " make me proud that I *have* differed from you, and yet have *differed* so little. I am

Your most affectionate Friend and Servant,

J. LAURENCE.

BECAUSE I am unwilling the Publick should be deprived of any of my Friend's cu-
 rious Reasonings and Philosophy, and because he was willing to explain himself further on
 the Head of *Lime*, &c. what follows in another Letter may not be unacceptable to the in-
 quisitive Reader.

Dear SIR,

" I Am persuaded, with you, that if a stiff Clay was lain down with Lime, it would
 " bear nothing; and that the more Lime was afterwards added, the *harder* and *har-*
 " *rener* it would grow. *Light Soils* therefore should be laid down with Lime; *stiff Ones*
 " taken up with it.

" Lime *crumbles* the One and *binds* the Other, by the same Quality and Power of its
 " Parts; that is, by the *attractive* Virtue of its *fixt* Salts, and the *active* Power of its *actual*
 " Fire. Salts are hard Bodies endued with much Surface; which Surfaces coming into
 " Contact with one another unite, (for Attraction is in Proportion to the Points in Contact)
 " or disunite, as any other Body mingled with it can hinder the Contact, or join with
 " them, by offering more Parts to contact. Water insinuates itself into its Pores, and by
 " that means attracts, and is attracted by Salts, and they are dissolved, *i. e.* dispersed and
 " suspended in every Part of the Water, and so kept asunder out of the Sphere of their
 " attractive Powers: But if the greatest Part of the Water is evaporated, then the Parts
 " of Salt come nearer to each other, and within the Reach of their mutual Power, they
 " shoot into *Crystals*, *i. e.* unite their Parts into Masses, till they become visible. Anal-
 " gous to this, Mortar is made by Lime; that is, all the Fire contained within the Stone,
 " and not united to its *fixt* Salts, (which Union makes those Salts so remarkably caustick)
 " is suffered to go out, by the Salt's being dissolved by the Water; but the Water which
 " at first dissolved the Salts, in the Stone being evaporated by the Fire which was thus
 " emitted, they run into Contact and unite; and unite also between themselves the Sand,
 " and other Materials mixt with it.

" But had those Materials been in Quantity sufficient to keep the Parts of those Salts at
 " a distance from each other beyond the reach of their attractive Virtue, which is of a
 " very small Extent, they could never form a Mortar, and then only would attract the
 " Parts of Matter which surrounded them: By which, if these were before disunited,
 they

“ they would be *clotted* and become firmer; but if before they were strongly united between themselves, they would be *crumbled*, the Attraction to the Parts of Lime overcoming the Attraction of the Parts between themselves, just after the same manner as Salt is dissolved in Water; but if the Water is evaporated, the Salts shoot again, i. e. *reunite*. So when Clay is *tendered*, if that which kept the Parts of the Lime at distance, is by Rain and Vegetation drained away, it answers to Evaporation in the other Case, and it binds unconquerably hard.

“ I do not chuse to use the Terms, *Poison*, &c. because they convey Ideas of an *Effect*, and not of a *Cause*; which will be demanded from you. I do confess, that your Objection and Observations on what I have offered, appear to me a great Evidence that I explain this right; because every Case you state is solvable by those *simple* and *uniform* Principles. And I believe no Fact can be offered, but may be made intelligible by this Method of Reasoning: And if a Farmer well understands this, he can never be at a Loss to know when to use *Lime* or to forbear, or what Manure is best for every kind of Land: Too loose Soils must be *hardened*; too stiff must be *tendered*; *both* enriched. Lime and Clay, added to the sandy Fields, will give them a Firmness; Lime at first breaking up used with Clay, and the continual Quantities of Sand, or Things analogous to it, as Coal-Ashes, &c. added in a plentiful manner, will subdue the other; but *both* can only be enriched by Air, Rain, ascending Steams from below, or the Parts of Vegetables, or Animals, (which have fed on them, or on what feeds on them) the Parts of these are broken into their original Particles by Fermentation, and so fitted to re-ascend into the small Tubes of Plants and unite with them.

“ This Ascent is caused by the Heat of the Sun expanding the Air lodged with the Earth, and Moisture, which carries up with it little Films of Water, which roll themselves round a Particle of Air, and form by that means a minute Bubble. All Steams are minute Bubbles, as I could produce many Experiments to prove. With this Water is united Vegetable Matter, and is sublimed with it in the Bubble.

“ A second Cause of this Ascent is internal Heat, which also rarifies the Air mingled in Earth, and carries up in like manner Films of Vegetable Moisture. A third Cause is that which makes Fluids ascend between Glass Planes and form an Hyperbola, and in a Series of Glass Tubes. The Law of Ascent is, it mounts highest in the smallest Pipes; but no Tubes are smaller than those of Plants, therefore the Fluids would get up some way by this Principle alone; the other two assist and compleat it. From this Principle it must follow, that Plants which have the *largest* Vessels will be the *lowest*; which is confirm'd by Experience; the *loftiest* Trees consisting of firmest Timber, whilst *creeping* Plants, are soft and succulent.

“ When I began this Letter I resolved to have filled it with some Thoughts about *Air*; but other Things came in the way, which I thought not improper to send to you, because possibly not less necessary to clear up what I had said before.

“ That Hint I have added about *Air*, is a very small part of what that Fluid performs in Vegetation; but I could not explain the Ascent of the Juices, without anticipating so far what I have to say, and shall send to you. That Water is fitted to form itself into Bubbles, is evident from its *frothing* on Agitation, and its boiling up when in an Air-Pump. But this Experiment proves clearly, that there is a considerable *Tenacity* between its Parts; because a fine Needle placed Horizontally on cold Water, swims; which would not be, if the Tenacity did not overcome the different specific Gravity. No Art can make it swim on boiling Water, because that violent Heat by its Motion destroys a great part of the Tenacity, and then Gravity acts uninterrupted; but that there is still some Tenacity between Parts of boiling Water is evident, because the Steams which ascend, beheld in a darkened Chamber, into which a Sun-beam is admitted through a very small *Foramen*, by this Beam appear nothing but minute Bladders of Water, containing highly rarified Air. I'll soon offer some Hints about *Water* to your Consideration; which either use or destroy as you please. I am,

Dear S I R,

Your Affectionate, &c.

THAT I may not be thought tiresome on the Subject of *Lime*, whilst I am treating about the Nature and Properties of *Water*; I shall only sum up the whole, as follows. That *Lime* is an excellent Manure, rightly and discreetly apply'd, Dr. Woodward, my Friend, and my self, are all agreed; but I am still so unfortunate as a *little* to differ from the two former,

former, as to its *operative* Effects, and the *Manner* of applying it. Those two learned Gentlemen think *Lime* doth not *fatten*, but only *mellows* the Ground, affording no Matter fit for the Formation of Plants, but merely *softens* and *relaxes* the Earth; but because I have found by long Experience, that from its heavy, saddening and binding Quality have been drawn forth the greatest Riches on light and mixt Soils, I saw nothing contrary to Reason and true Philosophy, but that the Dust and most minute Parts of Lime (which is a calcined *Mineral* and full of Salts) might *themselves* by the help of Water, be carried up into the Vessels of Plants for their Augment and Encrease.

Poor light Land is certainly made *fatter* by Lime; and *rich* cold Clays do not need it, especially at first breaking up, whilst the *Sward* is left uncorrupted, and the Roots and Fibres of the Grass keep it sufficiently porous and hollow, to receive the fattening Dews of the Air; and yet if *Lime* is afterwards repeated here, it is by all agreed, and found so by long Experience, to do more harm than good.

Agreeable to this Philosophy and Reasoning it is, that the Farmer sometimes lays his Lime upon light spongy Soils, (where Furze or Broom have grown, and much *worn out* the Ground) even at first breaking up; but then it is not with a View to *open* and *relax* it, (for *that* it doth not want) but to *fatten* and *enrich* it, as well as to *sadden* and *bind* it; and to give it such a proper *Tenacity*, that moistening Dews and Rains may not sink too soon away, nor be too soon exhausted by the Heat of the Sun.

Reason and Philosophy are great Helps to the clearing up the Truth: But abstracted from Experience, under the Semblance of Truth, they often lead us into Errors and Mistakes. And possible it is, that my own adhering to *seeming* Reasons, and misapplying Experience to them, may be the Cause that I am not yet convinced of the Justness of the Conclusions drawn by those learned Gentlemen above.

Of Inclosures.

IN *Northampton* and *Staffordshire*, and in several other Inland Counties, there is great Difference between the *Common Fields* and *Inclosures*: This *last* has seven, eight or ten Years Crops successively, when the *other* has them but two Years in three. This employs, besides the extraordinary Tillage, a great Labour, both of Man and Horse, to manure it; and the Product is more than twenty Bushels to the Acre; and at the End of its Ploughing, when it is laid to gain fresh Heart, it yields good Grass, and no Time at all is lost. And I am told by a Gentleman in *Lancashire*, that there they *Marle* their Inclosures, then Plough twelve Years together; then *Marle*, and Plough for twelve Years more; and so *ad infinitum*. For it must be granted to be a true Maxim, *That the Ground is never weary of doing Good*, if well fed, and well worked. So that I cannot but admire, the People of *England* should be so backward to *Inclosure*; which would be worth more to us, than the Mines of the *Indies* to the King of *Spain*. *Inclosure* encreases the Rent of Land sometimes Ten-fold; and yet it is believed, that almost one Half Part of the Kingdom are *Commons*: But to be sure, a Third of all the Kingdom is what we call *Common-Fields*; and if so, then the raising the Rent of *these* will vastly enrich the Kingdom, though we abate Eight of the Ten-fold.

England has been allowed to contain *Nine and Twenty Millions* of Acres; but it is reasonably supposed, that there are about *Forty Millions*. If so much; then about *Thirteen Millions* of Land will have its Price doubled, at least: And suppose it now but a Crown the Acre, one with the other, it will improve yearly above *Three Millions* of Pounds *Sterling*; almost enough to pay our Taxes, and sometimes more.

Some People have urged, that the Improving of some Ground would depreciate the Price of others; and so the *whole* be no ways benefited. But this has been rightly answered, that Improvement will encrease more in Quantity; the Consequence of which will be, that either more will be exported in Kind, or it will *farther* Improvements, or feed more People, or be thrown away; but who ever did so with their Hay, Corn or Cattle?

If some should urge, that the Product will be Grass, but no Corn for the Poor; the contrary is notorious in all inclosed Counties: For we see ploughed Land in Inclosures almost every where. But if Pasture should be thereby increased, will not the Wool and
Skins

Skins, produced by an Acre of Pasture, make greater Employment for the Poor, than the Tillage of such an Acre can do? I think the Answer is plain, they will: And yet there will be an Overplus of Corn for the Poor too.

In short, there can be no Argument used against Inclosures, but what, if it proves any thing, will prove too much, *viz.* That if the Land is made *better*, the Inhabitants will be made *worse*; or that Riches will be made a Burden. The Absurdity whereof is easily seen in *this* Light, tho' not perhaps in the *other*. Without all question, Improvements, of what Kind soever, make *Riches* and *Plenty*: And *Plenty* calls together Inhabitants and People to consume it: And even the Overplus is demanded in a Foreign Trade; which naturally tends to maintain the Grandeur and Magnificence of some, and the Luxury and Intemperance of Others.

However, the *Abuse* of Wealth is no Argument against an *honest Industry* in getting it. And it is certainly a Blessing to him that knows how to make a wise use of it, *i. e.* *To be a Father to the Fatherless, a Husband to the Widow; To be Eyes to the Blind, and Feet to the Lame.* To have a Power of *Improvement*, and not to *improve*, is to have a Talent laid by or hid in a Napkin; which is an Indolence and Slothfulness always accounted *Criminal*.

But because what I have hitherto said may be thought too general, to make any great Impression upon those who are not yet convinced that *Inclosures* are a general Advantage both to Poor and Rich; it may be observed, that the *Wastes* and *Open Fields* draw to them the Poor and Neccessitous, only for the Advantage of Pilfering and Stealing; who, when an *Inclosure* is once resolved on, will be employ'd for many Years in planting and preserving the Hedges; and afterwards will be set to work, both in the Tillage and Pasture, wherein they may get an honest Livelihood. And as to the Proprietors, their Advantage in *Inclosures* is undeniable; if there were nothing else in it, but that it lays a Foundation for *Industry*, and gives a Man Security in the quiet Possession of his *Labour* and *Care*, which he is never sure of in the *Wastes* and *Open Fields*. But indeed, the Observation of only these two Things; the great Quantities of Ground that have been of late inclosed and are daily inclosing, and the Increase of Rent that is every where made by those who do inclose; sufficiently demonstrate the Benefit and Use of *Inclosures*.

This Improvement has been most neglected in the *North* of *England*; tho' it is now sufficiently plain they begin to grow wiser. And as to the Bishoprick of *Durham*, which is by much the richest Part of the *North*, it is remarkable, that Nine Parts in Ten are already inclosed, and consequently improved in their Value and Rents to a degree almost incredible. Accordingly, the more *Northern* Parts are following their Example. For tho' the *North* is come latest into this good Husbandry, yet if we consider it well, it receives the greatest Advantage thereby. A good tall Hedge-Row preserves the Ground warm, and defends it from the violent and nipping Winds, that generally destroy and pinch much of the Corn, Pulse, Grass, or whatever grows in the open Fields or Champion Grounds; preserving it also from those drying and scorching Winds, so frequent in the Spring; and encouraging that Fertility and Richness, which the Land is either naturally subject to, or that is added by the diligent Care and Expence of the Farmer. Moreover, it is a means to furnish the Husbandman with a greater Burden of Corn and Pulse; and when it is laid down to Grass, yields much more than the open Field. The Hedges also being well planted with Trees, afford Shadow and Shelter for the Cattle, both in Summer and Winter; which else would destroy more with their Feet, than they would eat with their Mouths; presenting at the same time the Husbandman Necessaries for the Maintenance of his Fire, his Plough, and his Cart.

Besides: If the Trees in the Hedge-Rows be discreetly chosen and rightly planted, there may be a Supply of Mast for Swine and Fruit for Cyder. So plain is it that Inclosure is the greatest Encouragement to good Husbandry, and a Remedy for Beggary, the Poor being employed by the continual Labour that is bestowed thereon; which is doubly repaid, as I have observed, by the fruitful Crop it annually yields.

Neither indeed are *Inclosures* subject to several grand Inconveniencies that attend the *Common Field*; which, being generally sowed with Corn, are subject to be spoiled by Cattle, that stray out of the Commons and Highways adjacent to them. The Tenants also or Owners of the several Portions are strictly bound, whatever other Business they have upon their Hands, to keep exact Time, as well in *sowing* as in *reaping*, if they would secure the Fruits of their Labour to themselves.

Moreover; the Differences of the Profits are plainly to be discerned by the *Severals* or inclosed Parcels of Land that have formerly been taken out of the Common-Field, even
K how

how much they excel the other in every Respect, tho' of the same Soil, and only an Hedge between, and what a yearly Value they bear above them.

It is further observable of most Sorts of Lands, that by how much the *smaller* the Inclosure is, the *greater* yearly Value it bears, and the *better* Burden of Corn and Grass; and, on the contrary, the *larger* the Fields or Inclosures are, the *more* they resemble the Common Fields or Plains, and consequently are *most* subject to the like Inconveniencies: Inso-much, that generally speaking it is found that a Farm, divided into many *Severals* or *Inclosures*, yields a greater Rent than if the same were but in few: Tho' at the same time it should be observed with Caution, that *too many* tall Hedges, especially if interspersed with Trees in rich watered Meadows, do harm to the Soil and sour the Grass; which yet may be much prevented by taking off all *projecting* Branches.

Having thus far cleared the way, by removing Objections against *Inclosures*, and shewing their general Benefit to every industrious Improver; the next Thing we have to do, is to lay down some general Directions for the performing that Undertaking in such a manner, as may *best* and *soonest* answer the End and the Design of it.

Every one knows, that as soon as an *Inclosure* is agreed upon, each one's Portion and Share must be divided and ascertained to him, by throwing up Ditches in their proper Places and Boundaries. But as there have been great Errors and Mistakes committed in this important Work, it will be necessary to be a little particular herein. He that plants either Hedges or Trees, plants for his *Life* and *Posterity*: And an Error in the Beginning of such a Work, is very undefireable; because tho' it may and will end in *Repentance*, yet the Mistake here, ordinarily speaking, cannot easily be rectified afterward: The best Way is to be wise in Time, and to take Advice beforehand.

A *provident* Person therefore, who foresees (as commonly it may be foreseen) that a large Demand will be made of such proper Sets as may serve for a lasting Security against all *Trespasses* and *Encroachments*, naturally thinks how to do this in the *cheapest*, as well as the best Manner. For which Purpose, a large Quantity of *Hawes* should be got together before Winter: And because (whatever ignorant People may say) they will *sleep*, not shoot, the first Year; it is the most adviseable way, to prevent a Year's Weeding, to bury them in a Hole in the Ground all in one Heap; and at *Michaelmas* or *Martlemas* following, sow them in such a convenient Place or Nursery, where they may stand four or five Years carefully cleaned from Weeds. Here will be a constant Seminary for all Demands, and at all Times. Moreover, *Quick-Sets*, thus raised, are much to be preferred to those which are gathered out of the Woods, and from the Bottom of Hedge-Rows, as having *straiter* clearer Stems, and *better* Roots.

It is very desireable, if possible, to have these *Quick-Sets* when they are as thick as one's little Finger; for besides, that it is plain from Experience that they will shoot much stronger, and consequently make a Fence much sooner, than the small sort commonly made use of; so also a less Number will serve the Turn.

The industrious *Incloser* then being furnished at hand, and with his own convenient Number of *Quick-Sets*; I advise by all Means, if possible, to begin his Plantation in *October*, and so continue it, when Frosts will permit, till the latter End of *February*; still remembering, that those which are planted in *Autumn* will much out-strip those planted in the *Spring*, especially if a dry Summer succeed.

There are several Methods used in several Countries for making *Quick-set Hedges*; but after long Observation and Experience, the Manner and Method I most approve of, is as followeth: Mark a strait Ditch out four Foot broad; and on that Side you intend to make your Bank, (which should, if possible, be to the *North*;) lay the Turf with the Grass-side downward *even* with the Edge of the Ditch; upon which lay some of your best Mould to *bed* the Quick in: Thus lay your Sets about eight Inches asunder, with their Heads cut off, and lying in a Posture betwixt horizontal and perpendicular *inclining*; only remembering the Convenience of future Shade, Mast or Fruit, now is the Time to put in at about thirty Foot asunder either a young *Oak* or *Ash* or *Crab* to be grafted.

When the first Row of Quicks is thus discreetly laid at their due Distances, cover it over with good Mould about three Inches, and lay a Turf upon it, as before, and on *that* plant a second Row of Sets in the Method as above, pointing to the intermediate Spaces of the lowermost Row, the Heads of the Sets extending themselves only an Inch beyond the Turf on which they lie: Cover these also with the best Mould, as you did the former, and top the Bank with the bottom of the Ditch. But remember not to load the Quick with too great a Weight of Earth, (not above six Inches;) and what is more throw on the Backside, on which is to be set the dry or dead Hedge to defend the *Whole*. Both
Sides

Sides of the Ditch are to be made *sloping*, till the Bottom is reduced to seven or eight Inches. Sometimes the Grass on the Edge of the Turf is apt to grow and to annoy the *Quick*; therefore it may be convenient to take off an Inch of its outermost Edge, with a Knife or other sharp Instrument, after it is laid. And having said thus much about planting the *Quicks*, I think I need not say any thing about a Method of setting the Dead-Hedge, which every Country is so well acquainted with; every one knowing that it must or should be such as will effectually defend the tender Shoots of the *Quick* from Cattle.

The Method of planting *Quick-set Hedges*, as they do here in the *North*, in *single Rows*, I can by no means approve of; and it appears to be *not right* for common Practice, for these following Reasons.

1. Because in case of a Failure in the Sets, (as some there will always be) especially if two or three happen to fail together, there must of necessity be a *Gap*; which is very undesireable in a Hedge that is to keep out Cattle of all sorts. For altho' indeed a *Gap* may be greatly helped and mended afterwards, either by planting other Sets in the Place of the dead ones, or by *plashing* or *laying* horizontally the neighbouring Sets at three or four Years old; yet neither these Ways are what any one would desire to chuse, as plainly losing Time, and not always answering Expectation.

2. Because single Rows, at the best, are much more liable to become thin and bare at the Bottom in Process of Time, and as they grow old: Inasmuch as then *Hogs* will easily be able to penetrate them, tho' at the same time the Hedges look fair and flourishing at the Top.

3. Because they want the Advantages for their Preservation, and to compleat their Goodness, which the present recommended Practice of the *South* Country of planting two Rows on a sloping Bank have, *viz.* That after three or four Years growth, by cutting down one Row after another, they preserve each other without a new Fence; which by this means soon becomes an *impenetrable Hedge*.

It may perhaps be wondered, that I have mentioned and recommended only the *Haw* or *White-Thorn* as proper for Hedges and Fences. But as *That* is undoubtedly the best of all Others, almost in every Soil and Climate, Nature having furnished it with such strong *Armory* and many Instruments of Defence, I cannot see Reason to leave a known good One for Others of more uncertain Value, or less esteemed; such as *Crabs* or *Elm*, &c.

The *Holly* indeed offers itself to our Choice with the best Reputation of most others, retaining its Leaves all the Winter, as a better Defence against the cold Winds; which being armed also with desperate Prickles, is a great Security against foreign Invaders. But as this is not ordinarily to be had in any great Quantities out of the Nurseries, (for Those out of the Woods are worth little) and being known also to be of a slow Growth, except in some particular Soils and Places, it hath been generally neglected, perhaps too much, (for it resists the coldest Winds and sharpest Seasons) for the common Use of *Inclosures*. The *Ilex* indeed in the *South* of *England* would be preferable to all other Plants, as growing quicker and higher than other Plants, and continuing green all Winter.

The *Black-Thorn*, which as some late Writers have been so weak to recommend, is plainly intolerable, and is to be avoided as a Nuisance and Pest to every Inclosure; like Superstition in Religion, or most noxious Weeds in a Garden, easy to be brought in, but hard to be got out; shooting up from every Fibre of its Roots, and spreading itself like Wild-Fire over the best Land.

Furze indeed is a Thing that will grow in old worn-out Banks, where almost nothing else will, and may be raised either from Seeds or Sets, and will make a very secure Defence; but then being so subject to *poison* the whole Ground with its Seed carried abroad by the Wind, it hath been generally rejected as rather a *Nuisance* than any *Advantage*, especially in good Land. We are told of a *French Furze* that will grow to the Height of fifteen or sixteen Foot, not subject to spread like the common sort; but I could never yet hear so much of its good Qualities, as to tempt any to reject the known Virtues and Goodness of the *White-Thorn* to introduce that.

But, besides the Method of *planting* of *Quick-set Hedges*; there is also something to be said about the Manner of *cutting* and *plashing* the same, when they come to be ten or twelve Years old; in the doing of which, there is required no little Art and Skill. For indeed, I can as little like and approve of the common Method of the *North* in the *cutting* their Hedges, as I do of their *planting* them. They only cut down their Hedges to about two Foot, and there leave them, oftentimes haggled and split with the Stroke of

of the Hatchet downwards, like so many Pollards standing close together: Whereas the more *Southern Practice* in *Northampton, Bedford and Hertfordshire*, is much rather to be commended and imitated; where they cut down their tall Hedges with Discretion, having always a Regard to the filling the *Bottom* of the Fence with young Wood. A good Dresser of a Hedge then should always contrive to leave the upright Stems at different Lengths: Some are to be cut to the very Bottom, others to be left two Foot, and others three Foot high; still remembering that the Stroke of the Bill move *upwards*, which will cause the Wound to be left *smooth*, the better to carry off the Wet.

But because there will always be some Defects in the best Hedges; wheresoever a thin Place or Gap is found, there some of the most convenient neighbouring Branches are to be laid down *horizontally* at different Heights to fill them up: In the doing of which, Care and Caution is to be used in these following Particulars. *First*, that the Top of each such horizontal Branch be pruned and headed: *Secondly*, for the better laying it *horizontally*, that it be cut half-way, and *only* half-way through at the Place where it is bent: *Again*, that no Branch be bent beyond an *horizontal* Posture, for then it will surely die: And *lastly*, that for the better *fixing* such Branches, a Stick with a Hook at the Top be thrust into the Ground to keep it in its due Place, except some natural Stay happen to offer itself in the Hedge.

After this is done, there is a good deal of Art and Dexterity to be used in *watling* the Top of the Fence throughout, either with some long slender Branches of its own, or with such Briars as can be conveniently got. An Hedge thus managed once in ten or twelve Years, becomes an *impregnable* and *almost* everlasting Fence; and at the same Time, affords a large and plentiful Supply of Thorns and Stakes for other younger Hedges, that are not able to defend themselves.

A good Husbandman, I should think, need hardly be told, that it is necessary, as often as his Hedges are thus cut, if not oftner, to scour up the Ditches, and to lay what will conveniently lie at the Roots of the Quick, for its better Nourishment and Defence both from Weather and Cattle.

If an Estate is to be divided, and now first inclosed, Beauty requires that the Hedges should be in strait Lines, or according to some Plan and Design; where Variety united by Uniformity will make a Farm more agreeable than a Garden: And what will be thus more pleasing to the Eye, will be cheapest and most convenient; strait Lines are the shortest, and *Gothick* Buildings are vastly more expensive than the majestick Simplicity of *Grecian* Architecture.

OF MEADOWS and PASTURE-GROUND.

AFTER an Estate is divided from the *Common Field*; and an *Inclosure*, together with the Method of doing it, is agreed upon: The next Thing to be considered is the *Proposition* that one Part ought to bear to another; and the natural Disposition of every Part should be settled and adjusted in such a Manner, that nothing may be wanting which might tend to enrich both the Farmer and the Farm.

For which Purpose it is generally agreed, that to make the *most* of an Estate, there should be a due and regular *Proportion* reserved relating to these three Things, *viz. Meadow and Pasture-Ground; Tillage; and Fallows*. Some think, that if *Tillage* and *Fallows* together be made equal to the *Meadow and Pasture-Ground*, it is sufficient. But this Proportion depends altogether upon the Nature and Richness of the Soil. For if the Land be naturally good for Corn, and a Supply can be had of a sufficient Quantity of Manure and Dung; then the greater Part ought to be reserved for *Tillage*. And so on the other Side, if the Land be naturally good for Hay and Pasture, and there be a good Demand for Both; then Discretion teacheth, that *Meadow and Pasture* are to be indulged.

And altho' I am now speaking of *Meadow and Pasture* under one Head, yet there is some Difference with regard to their Disposition and Place. The *Pasture-Ground* where Cattle of all Sorts are constantly bred and kept, must of necessity be well supplied with Water, or else many Inconveniencies and Damages ensue. But what is intended for *Meadow* being made *Several* in the most dangerous Time, (*viz. from May-Day to Lammas*) may do much better without such a constant Supply. Reason and Foresight therefore must here direct and govern. But the most desirable Contrivance (if it can be had) is to chuse a Spring or Supply of Water, that may answer several Inclosures at once: And this is not uncommon.

It is hard to chuse such a proper Place for *Meadows* as will answer all Seasons, and give Plenty both in Wet and Dry Summers. The *Up-land Meadows*, tho' they give the *least*, yet it is commonly the *sweetest* Hay. And the *Meadows* in Bottoms, tho' they give great Plenty, are sometimes subject to Inundations, or at least to such great Wets, as make the Hay *coarse* and *rank*. So that *too much* or *too little* Water are almost equally prejudicial to *Meadows*. But if one had the Choice of Land proper for *Meadow* and *Pasture* too, it should be such as lieth low, or on a hanging Level, or on such a rich Soil as hath a moist Bottom, especially where some little Spring or Brook may be brought over it, and where there is some Descent in the Meadow to carry Water off on occasion. These are much better Circumstances and Situations than those by great Rivers, where the Crops are so frequently lost or spoiled. The worst Circumstance of elevated *Meadows* is, that they often need Help and Mending; which the other seldom or never do, except when it can be easily done, and without Charge.

I shall have occasion hereafter to speak particularly of the Nature and Properties of all the several Sorts of Dungs and Manures proper for Improvement both of *Meadow* and *Pasture*. I shall only therefore here put the diligent Farmer in mind, that what Dung soever is laid either in Pasture or Meadow, should be well harrowed in with Thorns drawn thro' the Back of the Harrow. And this is a Work may be done all the Winter till *Candlemas* or *Lady-Day*; when the Stones or other useless Trumpery should be taken off, and the Bottoms of Hay-Stacks, and whatever Hay-Seed can be got together, laid on; which is much better bestowed here than on the common Dunghill, which would produce Grass and Weeds amongst the Corn.

There is little need to say much of the other sort of Grazing-Ground, or *Meadows*, lying near Rivers or Fens; because their greatest Improvement is overflowing, which brings the Soil of the Uplands upon them; so that they need no other mending, tho' constantly mowed: Which Overflowing, and the Method of doing it, is so *easy* and *natural*, and of late so *well understood* by constant Practice, that I shall not need to say any thing further on that Head, but refer the Reader to some general Direction under the Chapter of *Improvements*.

As to the stocking either Meadows or Pasture with proper and suitable Cattle, here lies the great Skill and Management of the Grazier, which yet is generally pretty well understood, *viz.* That the best Ground is to be stock'd with the best and largest Oxen, Cows, and Sheep; the middle Sort with a lesser Size; and the more barren with Sheep alone, and those chiefly Ewes for a breeding Stock; the rocky Part with Goats; and the worst with Rabbits. For indeed, nothing is of greater Prejudice to the Farmer, than stocking his Land with Cattle that are larger than it will well bear.

Of Making HAY.

IN discoursing of *Meadows*, we are naturally led to say something of *Hay*, and the several Methods of managing and making of it: For by a right and timely Care in this Particular, the provident Farmer secures a Winter's Sustenance for his Cattle, when Nature has denied them the immediate Product of the Earth, lock'd up with Frost or covered with Snow. Nay, and the same Wisdom teaches him this further Providence, to lay up a good Store in a plentiful Year, to supply his unavoidable Want in a dry and scarce one. And then it need not be said how much Diligence and Care ought to be used in the making and managing of that Food, which if it proves bad and damaged, doth but deceive both the Cattle and the Owner.

It should be observed then, that tho' it is not so material for the *Pasture* to be laid level and free from Banks; because the Grass will grow for Bite well enough, and some think better, among small Hillocks and little Unevennesses of the Ground: But yet it is otherwise with *Meadows*, which should be very carefully levelled in the Spring, and the Dung made thereon beaten to pieces and scattered. And if a good Husband can at all suffer them, all Mole-Heaps and Ant-Banks must be spread abroad and dispersed; that the Stroke of the Scythe may not be interrupted in Harvest, nor hindered from coming near the Ground. For constant Observation makes it undeniably true, that *one Inch at the Bottom is worth four at the Top*. And that the Force of this Rule may not be weakened, by imagining that what is left, is not *lost* in an Inclosure; it is to be considered, that what is called the After-Marsh is not properly what is left from the Scythe; but rather what presently grows up after the Mower is gone: For what the Scythe leaves is in the main little else but the Stumps of full grown Grass, worth little after it is died in the Sun three or four days;

and yet would have made a considerable Addition to the Bulk of Hay made and disposed of in proper Season.

The Time of *laying* Meadows for Hay is very different, according to the Nature and Situation of the Ground, and according to the different Rules and Practices of the Country in letting their Farms, and for the Convenience of their Cattle; but all agree, that the sooner they are *laid* the better. Near *London*, where they have Dung enough, and where they have commonly two Crops in a Year, their common Practice is to lay their Meadows about *Candlemas*; and then they will be fit to Mow the first Time by the Middle or the latter End of *May*. But the more common Practice in the Inland and more *Northern* Parts is, not to lay them at soonest till *Lady-Day*, and too often not till *May-Day*. By which means, if a dry Summer comes on, they are scorched up, and disappointed of a Crop; which yet they are forced to wait for even till the latter End of the Year, and then likewise often find themselves disappointed: And, which is worst of all, what they have is not near so good as Hay in its proper Season.

If, by the Blessing of God, their Labours and Expectations are rewarded with a good Crop, there is yet great Care and Caution to be used in the *making* and gathering it together. In the doing of which, there is great Difference between the *Southern* and the *Northern* Practice. In the *North* they only turn it in the Sun two or three times, still letting it lie in the Swarth and in Wind-Rows, without putting it in Cocks; till at last they think it is well nigh *made*: And then they put it in large Cocks, letting it stand in the Meadows a Week or Ten Days to sweat: And after that they carry it home, or make a great Rick of it abroad.

Which Practice methinks cannot be altogether justified; inasmuch as it subjects the Hay to be Mow-burnt, and to lose its Colour. And howsoever these Things may be disregarded, it is certain, Loss of *Colour* is always attended with some Degree of Loss of *Taste*, and consequently of that real Goodness and Proof which should be given to Cattle that eat it.

The Practice therefore of the *South*, and their Industry and Care in making their Hay, so as to preserve its Colour, is much rather to be commended and imitated. For when the Time of Mowing their Grass is come, which they judge of by its looking brown, and beginning to bend its Head, they let it lie in the Swarth after Mowing, sometimes two or three Days, but take the first fine Day to cast it abroad, which is called *Tedding*; at Night they make it into little Grass-Cocks. The next Day (if fair) as soon as the Dew is off the Ground, they spread it again and turn it, that it may *wither* on the other Side; and so before the Dew falls in the Evening, it is Cocked up again. The next Day it is spread again, and drawn into long Wind-Rows; which is a convenient Method to dry the Hay, and makes it easy to get together again in Case of Rain, so as to be made into Cocks; in which they are very dexterous and expeditious. Before these large Cocks are carried, it is very proper just to spread them in the Sun, because it is apt to *give* in the Cocks; and if any Rain happen to fall, do not turn it till the upper Part be dry; for to turn the wet Grass to the moist Earth, is dangerous. Where thick-leaved Weeds are much amongst the Grass, more than ordinary Drying and Weather will be required: But when Season favours, call in all the Hands and Help you can, that it may appear the old Proverb justly takes place, *Make Hay while the Sun shines*.

It needs hardly, I think, be said, that Mowing of Land too often and too long, is a very great Prejudice to it; except it be such Meadows as are constantly mended with Plenty of Dung, or with Water-Floods. Therefore where these Conveniencies are wanted, once in Three Years at least, your Mowing-Ground should be fed with Cattle: *Feeding* being as requisite and necessary for Hay-Ground, as *Fallowing* is for Corn.

Having above treated of Meadow-Grounds, as reserved for Grass and Hay; it might be expected that I should, in the next Place, treat of the several Sorts of artificial Grass-Seeds, which have of late Years been used with so much Success, that almost every one knows the vast Improvements in Husbandry made thereby. But because their Use and Advantage depends greatly upon the right Knowledge of Ploughing and Sowing; and because they are seldom made use of but for laying down the Land after two or three Crops of other Grain; I shall reserve the particular Consideration of them, to their proper Place, and proceed to treat concerning *Tillage* and *Arable-Land*; which will lead me to consider the several Methods of Ploughing, and the proper Seeds to be sown upon the several Soils most agreeable to every Kind of Seed.

Concerning ARABLE-LAND and TILLAGE.

TILLAGE is that Branch of Husbandry, which, if duly managed and well understood, brings undoubtedly the greatest Profit to the Farmer: And if not understood or wrongly managed, will, of all other Employments, soonest bring him to Beggary. It is a mistake to think that the chief Gain and Advantage accruing to the Husbandman, is from the Labour of his Hand: For tho' a constant Assiduity and Care and Application of his Mind to his proper Business be absolutely necessary; yet his Eye to watch, and his Understanding and Judgment to direct, are the chief Hinges upon which the Success of his whole Business depends.

As to the Management of his *Arable-Land*, which falls under our present Consideration; tho' it is a Knowledge, for the attaining whereof there is required a good deal of Application, yet much also of the Mystery lieth in a discreet suiting each Sort of *Soil* with right *Seed* and proper *Manure*.

Which Mystery, tho' it has been of late Years pretty well explained, and better understood by Practice; and because there are yet very many People in this Kingdom unaccountably wedded to their own Customs, and *will* look upon every new Improvement, that shall drive them from their antient Faith, to be a Sort of *Herefy* in Agriculture; yet I would fain hope, if I can but offer some such undeniable Reasons, as are founded on Facts, to convince their Judgments, that they will not any longer retain their Prejudices, but lend their helping Hand to enrich both themselves and their Native Country; that at length we may be the Envy of our Neighbours under every View.

In order then to attain a right and distinct Knowledge of the Art of *Tilling* Land, it will be necessary to say something of the *Plough*, the chief Instrument in this Work, and one of the first Things the Farmer takes in Hand.

Of the PLOUGH, and the several Sorts of them.

THE Reasons for Ploughing of Land are as follow: To kill the Weeds; to make the Ground loose, that the Corn may fall into any Part of it; and also that it may with the Rains and Dews receive the Nitre from the Air, in order to its Fertility. For the Air and Sun drying the Earth, make it more porous, and consequently more apt to suck in any fresh Moisture, which the Sun carries away again; but leaves behind it the Nitre, as not being subject, when joined with Earth, to arise by Heat; unless it be extreme, as all Chymists know.

Now if the Ground be seldom ploughed, there can but a little Part be made fit to receive the Nitre: Whereas if it be oft turned, there is so much more made fit to answer the Purpose of Vegetation, by the continual Suction of Nitrous Dews to every Part.

But that I may proceed to something Practical. It is very observable that the Make and Shape of the *Plough* is vastly different, according to the Fancy or Humour of the People, or it may be the real Exigence of the Soil and Situation of the Place. Some differ in the Length and Shape of their *Beams*; Some in the *Share*; Others in the *Coulter*, and in the *Handle*: Every Place being almost wedded to their own Form; not always with a just regard to the real Goodness and Usefulness of their own particular Sort. I will not therefore so much as attempt to describe all the several Kinds in use; but shall content myself with mentioning some of the principal Sorts. Among which these which follow are;

1. The double-wheeled Plough, which for its general Use and easy Draught, justly deserves the Preference to all others, especially where the Land is hard, flinty, or on sharp Gravels. Nay, this Sort is singularly useful on strong Clays for the Summer-Fallows, even after the Sun hath hardened them to such a degree, that no other Plough will touch or penetrate. I remember at *Yelvertoft*, some Years the Summer-Fallow was half lost, and great Damage thereby attended the following Crop, till this Plough was introduced, to the great Benefit and Advantage to the Farmers. It doth not answer so well in wet Soils and Seasons; because Mire and Clay is apt to clog the Wheels. It is constantly and almost universally used in *Hertfordshire*, and elsewhere. Being made stronger than most other *Ploughs*, they are usually drawn with Horses and Oxen two a-breast; the Wheels being eighteen or twenty Inches Diameter; and the Furrow-Wheel is thought by some to be best made a little larger in Circumference than the other, which goes on the solid Land.

These

These are peculiarly useful for all Sorts of rough and uneven Work; they turn the Turf better than any of the common Sort, and plough up Mole-Hills or uneven Ground without levelling; and (as hath been observed) fallow Land in Summer in the driest Weather. The Fault found by Some, is their Handles; which standing sloping on one Side makes them very troublesome to hold, till they become well acquainted with them. And then that Difficulty becomes familiar.

This Plough being now become frequent, it will be no difficult Matter to get its Form and Make by *Inspection*, which is much better than the best Description: But I was willing to give it its Merit and Preference by such a Character, as may recommend it to the diligent Farmer for its general Use.

2. There is also a single-wheeled Plough much used in some Places, as it suits almost all Sorts of Soils, and is much lighter and nimbler than the other. But strong Land is too hard for it; otherwise if the Soil be light and clean, it may be drawn by one Horse and held by one Man, and yet near an Acre may be turned up in one Day.

3. The plain Plough, which is made without either Wheel or Foot, is what much keeps its Credit for strong and heavy Work, and will abide to be drawn with four or five Horses at length. It hath generally a good *even* Gate, and therefore fittest for all strong and clayey Lands, if they lie any thing level. But if the Land is extremely Irregular, or full of Stones, Roots or other stubborn Obstructions, there the double-wheeled Plough must take Place.

Besides these, there have been several Contrivances for Ploughs to make Expedition; which if they have not been found altogether to answer for general Use, yet Ingenuity should always be encouraged; because the old Rule takes place in this as well as in most other Cases, *Facile est inventis addere*. There has been a Contrivance of a double Plough, that with the Help of four Horses and two Men, a double Portion of Land may be ploughed, one Furrow by the Side of the other. Besides which, there is another of the Sort, whereby two Furrows have been ploughed at once, one *under* another; so that the Land is stirred up twelve or fourteen Inches deep, which would be in many Places of exceeding great Use: And I mention them with a View, that Others may improve them; as there have been of late great Attempts; when, for Instance, the Harrow has also been fixed to a Plough, that ploughing, sowing and harrowing may all be performed at the same Time.

The general Rules to be observed in the Shape of Ploughs, are these; (1.) They must be great or small, according to the Depth or Strength of the Soil you plough. (2.) The Coulter, where the Land is stiff, must be the greater and the stronger, and go the deeper; which must be proportioned to the Soil; because in deep Grounds the Weeds root the deeper: For the better cutting of which, some place on the right Side of the Coulter a small Wing, which cuts in two the Bottom of the Roots, and gives quicker Motion to the Plough. (3.) A great Art in making of Ploughs, is to make them go true to the Pitch they are set at, and keep to the Line you set them in, without swerving to the Right or Left; which depends much upon the Truth of the Iron-Work: And therefore it is rightly judged, that the Plough should rather be suited to the Irons than the Irons to the Plough, the Wood-Work being easiest altered if there be Occasion.

Upon the whole; and upon all Occasions great regard is to be had that the Plough be well proportioned for Strength to the Nature or Strength of the Ground that is to be ploughed; that the Irons be sharpened and wear bright; and by how much any Plough is made shorter or lesser, having its true Pitch, with its true Cast on the Shield-board by so much the easier it is both to Man and Horse.

But after all, if the *Plough* is made according to Art, with Judgment and Discretion; yet if either of them are wanting in the *Plough-Man*, from a too superstitious regard to the Customs and Fashions of the Place, to the great Prejudice of good Husbandry. Indeed, his own Experience will best teach him how to lay his Furrows; of what Depth he should plough them; and how he may be able to gain or raise the greatest Store of Mould: So also he must judge with Discretion how to order his Cattle, and chuse them for the diversity of Ground to be tilled. But in case the Arable-Land shall lie against the Side of any steep Hill, (as for the most part all barren Earths do) if a Man should plough that Land directly against the Hill, this very Labour would necessarily breed such a Wearisomeness in the Cattle, besides the over-heating and surfeiting them, that the Work must of necessity stand still. Wisdom therefore will teach him to plough it *Side-ways*, overthwart the Hill, where the Beasts may tread on the level Ground, and never directly up and down: By which means also the Compost laid thereon will not be so soon washed away from the upper Part; for the Furrows not lying strait down in an even Descent, but

turned

turned Crof-ways upwards against the Hill, must of necessity the better hold the Soil and Manure within it.

Of the Use of TILLAGE and PLOUGHING of LAND.

TILLAGE is a moving or stirring of the Earth; which being performed on the Top of the Ground, enters to a certain Depth, and makes the lower and upper Part change Place. In respect to *Arable-Land*, tho' the *Spade* was antiently used as well as the *Plough*, yet the *latter* being found more expeditious and convenient, the *other* is grown out of use.

The Lands proper or made use of for Tillage, are reckoned of three Sorts. 1. Such as clayey, stiff, cold and moist; which Sort of Land is usually *thrice* ploughed, *viz.* In the Spring, Summer, and at Seed-time, for Wheat; and *four times* for Barley. These Ploughings or *Fallowings*, as they are called, are very advantageous to the Ground; for hereby the Land by degrees is laid in such Ridges, as the Nature thereof requires: For the more in Number and the higher the Ridges, the better, generally speaking, they are for *Wheat*; which delights naturally in a moist Ground, provided it be not subject to be drowned or overmuch glutted with Wet. It is a means likewise to make the Land lighter and fitter for the Seed to take Root in; the Clods being apt to dissolve when exposed to the Weather, and often broken by the Plough. As also it kills the Weeds, and puts the Land into a Capacity to receive the nitrous Dews and celestial Influences, which more easily coagulate and fix on a light Earth, than on a sad and heavy Lump. Moreover, it defends the Corn from the Extremities of the Weather, especially the cold Winds; for the more uneven any Land is, the better it bears such Extremities.

2. Good rich mellow Land, that hath lain long in Pasture, till overgrown with Moss, is improved by Ploughing; *that* being not only a Medicine to cure its Moss and unhealthful State; but it raises an immediate Advantage, and improves the Land for the future, in case a Crop or two only be taken off at a time, and laid down for Pasture again well soiled or sown with Grasses; as shall be hereafter more particularly explained.

3. As for poor and barren Land, which hath lain long neglected and unimproved; here, without all question, Tillage takes place with great Advantage: Inasmuch as it is the readiest and surest Means to keep down, if not kill, all four Grats, Fern, Broom and Rushes; whereby an evil Juice hath been long contracted, so injurious to Vegetation and so hurtful to Cattle. But the Method of doing this to the greatest Advantage, with respect both to the Land and the Farmer, will be occasionally directed in its proper Place. Only I cannot forbear adding a Caution here; That great care should be taken, that such Land as this be not turned up above twice before it be laid down with Grass-Seeds, except some extraordinary Quantity of Manure be laid on: Inasmuch as it is a Work of the greatest Difficulty, Expence and Length of Time, to reduce Land beggared and worn out with indifereet and avaritious Ploughing; or to bring it into any tolerable Order for Tillage after gross Abuse.

Of PLOUGHING of LAND.

THAT the Time and Method of Ploughing may be rightly understood, we must consider distinctly what is commonly called *Layes* or *Greensward*, and *Fallows*. The Ploughing up of *Layes*, or Grass-Ground, is commonly performed soon after *Christmas*, and, if possible, when the Land is thoroughly soaked with Wet; for then the Turf is tough, and will not break in turning. In the doing of which, great Discretion in the Ploughman is to be used; that he turn the Turf in such a manner, that the Grass may not grow betwixt the Seams, and yet that he may go so deep as to get Mould enough to bury his Seed. For which purpose it is, that Ploughing so early is recommended, that the Frost and Weather may loosen and mellow the Soil, that at Seed-Time the Harrow may take place amongst the Roots of the Grass, and cover the Seed with a sufficient Quantity of Mould. Otherwise it is demonstratively true in Experience, that Seed thrown into *fresh* Earth answers the Expectation of the Sower much better, than where the Land is first ploughed and some time after sown. In this Case, however, it is seldom known that the Harrow will immediately take place after the ploughing up of *Layes*; and therefore it is generally necessary to wait a Month or six Weeks for a sufficient Depth of Soil.

Where the Sward is old and full of large Ant-Hills, it is usual in the first open Weather after *Christmas* to make use of a large Hoe, whereby to cut and disperse most of the Banks, that the Plough may proceed regularly and lay the Turf flat and true; otherwise much of the Seed will be buried with the Harrow, and yet some will lie so shallow as to be devoured by Birds.

In ploughing of Layes, some recommend the laying the Turf so perfectly flat, that you may not discern where the Plough went. But as this is hardly practicable, so neither is it very desirable; inasmuch as where the Turf *rides*, and is laid a little *sloping* one upon another, the Seed falls regularly between the Seams; and that is always found to make the evenest and the best Crop.

As to the ploughing of *Fallows*, and the Time of doing it, great regard is to be had to the Nature of the Soil. But the Benefit of it is allowed by All to be very great, by its universal Practice, and by the Care that Landlords every where take to oblige their Tenants to a strict Observance of it once at least in Three Years. The Advantages of this Practice are chiefly these Three.

First, It kills the Weeds, by turning up their Roots to the Air and the Sun in the driest Season; and if Wild-Oats, Darnel, or other noxious Weeds, happen to sow themselves afterwards; yet the Repetition soon again destroys them also, when they begin to peep out of the Ground; whereby the Heart and Strength of the Ground is preserved from such hasty Suckers.

Secondly, It is a Means to lay the Land in Ridges, thereby better exposing it to receive the nitrous Influence of Frost, Wind, Sun and Dews. These all tend to sweeten and mellow the Land very much; and the often stirring it breaks the otherwise untractable Clods of Clay, and so disposes the Ground to receive the Seeds with all the Advantages of a proper Soil mixt with Dung, and mellow'd with Weather.

Thirdly, The Fallows are a great Advantage and Relief to the Farmers Sheep, even till the middle or the later End of *May*, and in some measure all the Summer, especially in such Corners and Places near the Hedges where the Plough cannot come. To answer which Purpose the better, in the open Fields in *Northamptonshire* and *Leicestershire*, and in most of the Inland Counties, they contrive to leave a Baulk two or three Yards wide betwixt every Land, for Grass to support their Sheep in the Fallow-Field; and the same when it is Corn-Field, afford a considerable Supply of Hay; by which Means the Farmer many Years pays his Rent out of the Encrease of his Flock and his Herd.

The right and the best Method of ordering Fallows, is next to be consider'd. I think all are agreed, that after the Crop is off, it is best *not* to plough it, but to let it lie all the Winter, and to eat with Sheep or other Cattle what Grass grows thereon till *April* or *May*: For most commonly the Farmer, as soon as he has done sowing his *Corn*, begins to plough up his *Fallows*, as having little else then to do. But in the doing this, great Care and Caution should be used that the Plough do not go too deep, where the good Soil itself is but shallow; as in many Clays, Stony-Grounds, and Sands: For it should be consider'd, that Wheat and Barley take but a shallow Hold of the Earth; and tho' they require a rich and mellow Soil, yet not any great Depth; and therefore to begin a Fallow too deep, is only to bury the best Earth, to turn up a worse to receive the Grain.

It is no inconsiderable Circumstance, that the Farmer be also advised never, if possible, to fallow his Land in Rain or wet Weather; nor indeed, if it could be foreseen, * when it is *likely* to rain; for in a wet and moist Season, except the Roots of the Weeds (the stronger sort especially) be laid quite bare, they will grow and flourish soon after the Ploughing; and so a great Part of the Design of Turning the Soil will be lost; and the Land, tho' it have the *Number*, will really want the *Benefit* of Fallows.

Besides, there is a *Freshness* in the Earth, when it is first turned up, that is a great Means of attracting the nitrous Virtue of the Air and Dew to itself; which, if rightly understood, is the greatest Help to Vegetation, and a Means of that Fertility so earnestly sought for and expected from the fallowing of the Land. But in wet and showery Weather that *Freshness* is soon taken off, and the Pores of the Earth are filled up and glutted with such watry Particles, as immediately send forth Weeds; and so the Land, instead of *receiving*, gives Nourishment, and consequently wastes its Strength.

This Reasoning ought to be enforced on the Farmer in the strongest Terms, because I have long experienced that he is too regardless of this Matter: And because he has nothing

* The Method of judging of the Weather, by the Barometer, see in the Appendix.

else to do, will be thrusting his Servants and Cattle into this *unseasonable* Work; it being certainly true in this Case, *That it is better to do nothing, than nothing to the Purpose.*

The second Ploughing of Fallows, is by some called *Stirring*; by others, *Twy-Fallowing*; and this is performed commonly in *June*, or about a Month after the other, as the Weather (which is always to be regarded) will favour. Now the Days are long, and Hay-Harvest calling for Help, a good and provident Husband contrives to be out early in a Morning with his Team, to perform his *Quantum* of *Twy-Fallowing* early, by that Time the Dew is off the Grass, that so he may have Leisure to feed his Horses, and to attend both the making and carrying his Hay.

About the latter End of *July*, or Beginning of *August*, is the Time of the last *Stirring* or *Twy-Fallowing*; which should also be so contrived in the Morning, as not to interfere with or hinder either Hay or Corn-Harvest: And as to the laying the Land *up* or *down* with the Plough, Discretion must be used, and Regard had to the Wetness or Dryness of the Land; always remembring, that Wheat being to be sowed *Under-Furrow*, the Land at Seed-time must be ploughed *up*, and the Furrows laid so clean, that there may remain no Obstructions to hinder the Winter-Wets from running off.

In some Places where the Land turns up with great Clots, they make Use of the Harrow to break them before they sow their Wheat, and after that plough in the Seed, making many and small Ridges; which is much the Practice of *Cambridge* and *Hertfordshire*, especially in the gravelly Soils, subject to Wet. But in Clay and deep Land, it is thought much better to break the biggest of the Clots with a Beetle, that they may get just Mould enough to cover the Seed; knowing well that every Frost gradually dissolves Clots, and gives continual Nourishment and Relief to the Corn during the Winter; and even the Inequality of the Surface is found by Experience to be a special Shelter to the Corn from the Extremities of the cold *North* Winds, attended with Black Frosts; which are known to be the greatest Enemies to all Winter-Corn.

Altho' I have mentioned Fallowing as performed once in three Years; yet in Land that is but indifferent, shallow and poor, Fallowing *every other Year* is found to be the best Improvement, especially where there is not Plenty of Dung to be had; which Piece of Husbandry is as ancient as *Virgil*, who is made to advise us in modern Poetry, thus:

*In these unhappy Soils the Swains forbear,
And keep a Sabbath of alternate Year;
That the spent Earth may gather Heat again,
And, bettered by Cessation, bear the Grain.*

Lands thus ordered, are generally sown with Rye; and being very shallow and light, *He* is reckoned to be the best Ploughman, that doth but just superficially stir, or rather *scratch* his Land, provided he do it but oft enough, and give it a late Folding of the Sheep.

In some other Places they plough their Fallows but twice, trusting to the Strength and Richness of their Soil. But this Method is certainly wrong; for a well-ordered Fallow is attended with this certain Advantage, that it keeps the Land clean from Weeds; and therefore, if it do not want Fallowing to *enrich* it, it wants it to *mellow* and *cleanse* it.

In all such Fields or Land intended for Rye, the last Stirring or Fallowing should be performed earlier than if it was for Wheat, that it may be laid up and prepared for an early sowing the middle or the latter End of *August*; Rye being a Grain that is observed to be better for having two Summers during its Growth: For,

*That Crop rewards the greedy Peasant's Pains,
Which twice the Sun, and once the Cold sustains.*

As for Barley, which every one knows is not sown till the Spring, *this* will require no less than four Stirrings during the Summer. The last of which should always be so ordered as to lay up the Land conveniently high, and with as big Clots as may be, that it may lie the dryer all the Winter; for the preceding Frosts and Spring-Showers will quickly make it fine enough for sowing, provided the Furrows be kept clear, and the lower Ends of Lands open'd with Trenches to carry off the Water; which the industrious Husbandman always takes care of, whether it be for Wheat or Barley; rightly judging, that if it be sown, the Seed is all lost if it be suffered to lie under Water; and if it be not sown, yet that Part of the Land is beggared which is covered with Winter-Wet. And yet is not
always

always so well considered as it ought, what a great and manifest Loss this is to the Farmer; To be at the certain Pains and Charge to plough his Land four Times, to manure every Part of it, and then again to sow it with the same Diligence, and yet at last to lose the Fruits of all this Labour in such Parts as are suffered to lie under Water. At the same Time, the Goodness of the rest doth but reproach the Slothfulness of the Ploughman, who hath bestowed the very same Pains and Charge on that which is lost and good for nothing, when it might have been prevented by a timely Care.

Before I conclude this Head, it may not be amiss to advise, that if it so happen by Reason of a wet Summer, that after the last Fallow the Land laid up for Barley remain yet full of Weeds, it may be very proper to give it another Stirring during the Winter, either with the Plough or Harrow, in order to kill the Weeds; which Purpose would yet be more effectually accomplished, if the provident Ploughman could contrive this Work to be done before a Frost, or as soon as a Frost first and gently sets in.

Of the several Methods of laying up LANDS, in Ridges, in order to the Sowing of them.

THE great Mystery of rightly disposing Land to receive the Seed, and to preserve it after it is sown, is to lay it so, that it may be neither too wet nor too dry. Accordingly the several Customs of disposing the Land for Grain, are conformable and chiefly adapted to the Nature of the Soil and the Situation of the Place. In all the Clay and deep Lands of *Leicestershire, Northamptonshire, &c.* they sow all their Grain upon broad Lands, raising the Middle of the Ridges in some Places near three Foot higher than the Furrows: For indeed, the only Design of laying Land in Ridges, is the *draining* of it, and preserving the Seed from a fatal Evil, *too much Moisture*; and not, as some ignorantly imagine, in order to gain more Ground: For Grain as well as Plants and Trees, growing perpendicularly, it is plain to a Demonstration that an uneven Surface doth not increase the Quantity; and as to Hills, though they measure near twice as much as the plain Ground they stand upon, yet the Produce of the One can be no more than the Produce of the Other. But this hath been made very plain by Those who have treated of Surveying of Land.

Where either the natural Dryness of the Soil, or its convenient Declivity, doth not require the Land to be laid in Ridges, there the Ploughman only contrives to make such Divisions as may serve to guide him both in the Ploughing and Sowing, without regarding the Quarters of the Compass for the *running* of the Lands; which some have without any Reason recommended. Only here it may not be improper to observe, that where the Lands point directly *East* and *West*, that Side of the Land which faces the *South* will ever be the *leanest*, and consequently require the *most Manure*; inasmuch as tho' the Heat of the Sun always tends to accelerate the Ripening of Grain and the Fruits of the Earth, yet its more immediate Influence and direct Rays are observed always to exhale or extract the most of the Virtue and Riches of the Superficies.

Where the Lands require to be laid in Ridges, and the Furrows to be kept well drained, (as for the most part is necessary) here I cannot but again recommend a seasonable Care to carry away all standing Water from the Ends of the Lands, by making such proper Drains as may convey it to remote and lower Parts; because, as I have already observed, in the well draining of Corn-Lands lieth a considerable part of good Husbandry, and no small Advantage. Great regard therefore is to be had to that End and Side of the Land where the Plough *sets in*: Which as it will always of course and necessity lie *lowest*; so also that End and Side of it, where the Plough goes out, will always be *highest*. To remedy this Inequality, the Spade is to be made use of, to throw it from the higher to the lower Part, and that before it comes to be sown, at the last time of fallowing.

Moreover; if there be found a necessity of opening a Trench a-cross the Head-land by way of Drain; let it be done conveniently wide and deep enough, so as effectually to answer the Purpose of a Drain; and observe, that what is taken out with the Spade be not laid too near the Side of the Drain, as is too common; so that Horses, and other Cattle, poach it in again with their Feet: But let it rather be carried with the Cart, at some convenient Leisure, to such Places as want to be filled up, especially the lower Ends of the Land aforementioned. And if it be suspected, that the Grass or Sward may do prejudice to the Corn sowed on it, let it lie in one tall Heap in that hollow Place, and in a Year's time it will prove excellent Mould, fit to be dispersed, and to receive the Seed the following Season.

With

With such Care, and with these Precautions relating to Tillage, the Land will be put into such Order, that, with the Blessing of God, the vigilant Farmer may expect in due Time to see his Labours rewarded with a joyful and plentiful Harvest.

Of the several Times and Methods of sowing C O R N.

AS one Seed differeth in Nature from another, and as there are very different Soils to receive all the Variety of Seeds; there will of necessity be required good Judgment and Skill in the Husbandman to adapt *Kind*, and *Time*, and *Place*, to every remarkable Difference. And altho' this Matter hath been well studied, and of late Years is much better understood than formerly; yet some general Hints to remind if not instruct the Industrious, may perhaps be not unacceptable.

I think it is generally agreed, and found by Experience to be right, that *Changing* the Seed is a great Advantage and Improvement; especially a Change from a *worse* to a *better* Soil. But indeed *any way* is much better than *no Change* at all; inasmuch as all Seed whatsoever, if long sown in a Place, doth *degenerate*, and grow worse both in Quantity and Quality. A Change of Seed from a barren light Land to a rich heavy one, is thought good. But most of the Clays in *Northamptonshire* require their Seed-Wheat either from the Chalks in *Bedfordshire*, or from other neighbouring gravelly Soils: Having thereby two Advantages; of a Change of Seed, and of a greater Quantity in Number for a less; the Seed from such Soils being much smaller, and consequently spreads further. But in moorish Grounds, such a Change is undesirable, because there the Seed is apt to be buried: And therefore they chuse the largest Seed they can get. A Change from the remotest Part of the *North* is now well understood and known to be right; and so on the contrary, from the *South* into the *North*; which by means of Navigation is easily performed.

The *Time* of sowing Wheat and Rye, is from the middle of *September* to the beginning of *December*, if Frost permit; tho' Rye may be sown a little sooner on light Land. However, great regard ought to be had to the Weather, and the Nature of the Land you would sow. Dry Land may be sown in almost any Weather, either wet or dry. Whereas in moist Clays, if either Wheat in Autumn, or Barley in the Spring, be sown in very wet Weather, there is great danger that it will *burst*, or be buried with the binding Quality of the Earth; whereby the Seed is often shut up as in a Prison: Especially if it be sown *Under-Furrow*, as is the almost universal Practice with respect to Wheat, and sometimes Barley; and should be also with respect to *Beans*, as shall be explained hereafter. Sometimes indeed the Weather may prove too dry for Wheat in a dry Soil, whereby great Part of the Seed will be mustied and spoiled by lying too long in the Ground; and therefore it is better to stay till Rain come, or till there be some likelihood of it, the last Sowing often proving as good if not better than the first. But as for *Rye*, it is most desirable it should *always* be laid in the Dust.

All Summer-Grain, *Oats*, *Barley* and *Pease*, should be sown when the Weather is dry, and as soon as the Land will *work*, let it be thought never so early; tho' some Exceptions of Land apt to run to Weeds should be made. The Barley-Land having had four Fallows in the preceding Summer, and been ploughed *up* before Winter, let the Land be never so strong, and of so stiff a Quality, it ought to be ploughed *down* before it is sown; and because the universal Rule requires that Seed (if possible) should be thrown into *fresh* Mould, the Ploughing and Sowing should both be performed in one Day.

It is, I think, generally agreed, tho' not so universally practised as it ought, that the steeping of Wheat in Brine before it is sown will prevent the *Blas*t, and *Smut*; which proceeds either from too much Fatness or Rankness of the Land soiled with rotten or musty Vegetables, as Straw, Haulm, Fern, &c. or from the Seed itself mixt with Smut, which tho' it doth not grow, yet it is found to spoil and poison the Seed wherewith it is mixt; or lastly, it may proceed from a too frequent sowing the Land with the same Grain. The effectual Cure for this Disease, is the right preparing the Brine, and steeping the Seed.

Some do this Work too *superficially*; only throwing Urine upon the Seed, and mixing it therewith just before they go out to Sowing; or else make a good Mixture of Brine and Water, and only moistening the Seed with it on the Ground before they sow, without giving it Time to infuse or impregnate. By which means the End not being often obtained, they throw the whole aside, and content themselves to sow the naked Seed.

Whereas, to do this effectually, Wheat should be steeped in a Cistern and covered with a strong Brine, at least Twelve Hours; some allow Twenty four. After that, the Brine

is to be drawn from it, and preserved for further Use. But because the Seed when thus wetted would stick together, therefore unslacked Lime is presently to be mixt with it; which makes it dry again, and apt enough to separate in Sowing. This *Nostrum* is said to be discovered by the good Success of Wheat sown after the Accident of falling into the Sea-Water.

But neither is the mixing it with Lime to be accounted only an insignificant Circumstance with respect to Vegetation. For it is to be observed, that the manuring of Land with Lime, or otherwise enriching it with sharp or saline Dungs, do of themselves wonderfully contribute to keep Land wholesome and free from this and such like Diseases.

But besides this Method of steeping Wheat, to prevent the Disease of *Smut*; Mr. *Houghton* tells us of several Experiments he made about steeping Wheat and Barley in a certain Liquor, contrived to promote an extraordinary Increase. The Vehicle was thus contrived: "Take a convenient Quantity of Rain-Water, and in every Gallon of it dissolve two Pounds of Stone-Lime; let it stand two or three Days, stirring of it three times a Day. Pour off the Water into another Vessel; and to every Gallon of this Water put about four Ounces of Salt-Petre, and one pound of Pidgeons Dung. Mix them well together, by stirring three or four times a Day; and then strain out the Liquor to keep for Use." He tells us, he steeped a Handful of Wheat in a Quart of this Liquor; and after eighteen Hours, he took it out and laid it to dry in the Air for the space of one Day, and then steeped it in the Liquor again about twelve Hours; and having laid it to dry as before, he steeped it again a third time about six Hours, and then set it in his Garden, which was but common Earth, by single Grains, about ten Inches apart and a Finger's Length in depth. From hence he had an Increase beyond expectation; for from several Grains he had sixty or seventy, and from some eighty Stalks, with very large Ears full of large Corn; many of the Ears had sixty Grains in them, and none less than Forty. He also steeped Barley in the same Liquor, and found much the same Increase.

Mr. *Houghton's* Integrity in relating this should not be disputed; and there is no Improbability but so the Fact might be, as the Seed was sowed in Garden-Mould, and in a sheltered Place. And possibly had not the Seed been steeped in the Liquor, there had been a wonderful Increase from the Place and manner of sowing. But I my self have tried Barley steeped in a prepared Liquor much like this, and more promising: But being sowed in an exposed Place in a common Field, and on a Land not very rich, I found no extraordinary Increase; which made me desist from any further Trials.

And indeed (as I have elsewhere observed) both Reason and Experience pronounce, that all extraordinary forcing Ingredients, all Chymical Preparations, all Extracts of Salts from Dung, Lime or other Manures, will not have any abiding Effects, so as to answer the Charge much less the boasted and wonderful Feats attributed to them. And if at any time, or under some certain Circumstances, Nature is observed, by these forcing Methods, to mend her Pace; yet it is much under the like Disadvantages of a Horse forced beyond his natural Strength, he tires so much the sooner.

· *Of the several Sorts of SOILS good and bad, with some Directions interspersed how to improve them.*

HAVING hitherto laid down some general Directions for Tillage and preparing Land by the Plough for sowing; before I proceed to treat of the several Sorts of Grain, with the Time and Manner of sowing them, it will be requisite that I first say something of the different *Soils* ordinarily to be met with in the several Parts of this Kingdom; that something may be hinted at whereby to improve and make the best of them.

It is generally agreed, that all Sorts of Soils, wheresoever to be met with, must partake something more or less of either *Sand*, *Gravel*, *Chalk*, *Loam*, *Marsh* or *Clay*: But yet it would be as hard to give a proper Name to the different Sorts of these, as to assign the peculiar Qualities proper to those Names; because there are good and bad of almost all Sorts; inasmuch as the natural Richness of a Soil depends, in great measure, on a due Proportion and proper Mixture of some of the foregoing *Simples*. For which Reason it is, that Sand is recommended to be laid on Clay, and Clay upon Sand; because by such Mixture a *lasting* Improvement is gained, and the very Nature of the Land itself is altered and changed.

However, where any one of these *Simples* prevail in a great Degree tho' it would be hard or next to impossible to make an absolute Cure by Superinductions; yet by a prudent Care

Care and skilful Management, great Profit may accrue to the Farmer, by regular Observations of the Times and Seasons proper for ploughing and sowing each Kind of Land, and adapting the Seed proper to it.

Clays and *Chalks* are undoubtedly the best Soils for Wheat and Barley, after Summer-Fallows, and for Beans to succeed. And though the Clay is of itself never so stiff and untractable; yet the Summer-Fallows, with proper Manures of Dung, render it strangely mellow, and a fit Recipient for Wheat; which being sown before Winter, though the Surface be never so rough and full of Clots, will be so much the better defended from the *North* Winds. The Art in managing these very stiff Clays and Chalks, because they are very tenacious and hold the Water on their Surface, is to lay them dry, in handsome Ridges, that the Water may fall off every way. The worst Quality of them is, that in very dry Seasons they are very cōstive, hardening and chapping with the Sun and Wind, thereby subjecting the Crop to the great Inconveniencies of a Drought.

Clays are commonly sown, at first breaking up, with Oats; and if it is old Sward, it is thought the most profitable Way to continue sowing Oats for Three Years: For on such sort of Soil, I have frequently known ten Quarter of Oats upon an Acre; which will pay better than a good Crop of Wheat. After a Summer-Fallowing it may again be sown with Wheat; and after that with Barley; and again with Beans. But the most profitable way to save Dung, is to sow Clover with the last Crop of Oats, eating the Clover with Sheep for Two Years; and then Summer-Fallow it twice for Wheat at *Michaelmas*. *Chalks* require much the same Management, and will bear the same Grain; only if much Rain happen to fall on them just after sowing, before the Corn gets up, the Earth is apt to bind so hard, that the Corn cannot easily get through it; which Evil is much helped with a light Harrow.

Sand and *Gravel* Grounds easily admit both of Heat and Moisture; which bring the greatest Helps to Vegetation, if they could but be persuaded to remain in any due Proportion, great Riches might be expected from them. But as they are very apt to lose the Blessings of Heaven, and to suffer the Crop to die away with scorching Heat, the Ploughman contrives to lay his Lands as flat as possible; and to let all his Superinductions be of the most cooling and binding Nature, such as Cow-dung, rich Clay, Lime, Chalk, and Marle. The Seed proper for such Soils is Rye, Oats, and Pease blue and white: For except it be mightily altered with the afore said Mixtures, it is too light for Wheat and Barley.

At the first breaking up of *Sands* and *Gravels*, or other very light Land, *Oats* are commonly sown after the Sward hath lain near Two Months to rot. As soon as the Oats begin to appear, the *Whole* should be rolled with a good heavy Roll, either round or octangular, which fastens the Ground about the Roots. For want of the Knowledge of this Practice, many Places in the *North* of *England* content themselves to lose the first Year's Crop, only turning up the Soil twice or thrice in the Summer; imagining that the Sward newly turned downwards will keep the Soil so hollow, that the Grain sown thereon would perish: Which indeed might be true, without the Help of a Roll; but with that Help, we always reckoned and found in *Northamptonshire* that the first and second Crops were the best.

It is observed in *Herefordshire*, they make a very great Improvement of sandy Land much given to Moss, by burning the Moss, and mixing the Ashes with Lime. After this they plough it and sow it with Rye; which yields a mighty Increase, and (which is a very desirable Circumstance) brings a sweet Sort of Grass upon it, when laid down after a Crop or two.

In some Part of *Oxfordshire* and *Buckinghamshire*, they have a very untoward churlish sort of Soil, which puzzles the Farmer to make it fertile: They call it *Malm*; it is neither *Clay*, nor *Chalk*, nor *Marle*; but hath something of the greazy Nature of them all, but no Part of their good Qualities; insomuch that it is with great Difficulty that any thing will be made to grow on it. The Roots of Trees plainly avoid it, if possible; and it is found to be very hurtful to all Fruit-Trees. It seldom indeed lieth near the Surface, but it holds the Wet, and strikes such an unwholsome Coldness to Corn, Plants, and Trees, as mightily hinder their Vigour and Maturity. Notwithstanding, I cannot find that it hath any thing nigh that Malignity in it, which is so plainly and constantly found in a *Stratum* of Earth, in the Bishoprick of *Durham*, dug out in great Abundance in their Search after Coals. They call it *Thill*; it is of a bluish Colour, turns out like thin Slate, but crumbles to Pieces with the Frost, as if it would be a fit Recipient for almost any Seed or Plant. But such is its Hatred and Aversion to all Vegetables, that it kills and destroys them as soon as they approach it. It lieth indeed naturally at a considerable Depth in the Earth; but as there are great Numbers of Collieries, some Parts of the Country are greatly annoy'd with its vast Heaps; insomuch, that it hath put some curious Gentlemen upon Trials and Experiments

Experiments how to remove its obstinate Sterility, and to make it fertile, even to avoid the Trouble and Charge of removing it into waste Places. But all hath hitherto been in vain; for it not only refuseth itself to be made good, but it poisons and corrupts all Mixtures, and makes every thing that comes near it as bad as itself: For not a Spire of Grass, nay, not a Weed will grow on it. It will not so much as mend the High-Ways; but yet it hath been made useful there, by filling up hollow Places, being good for nothing else.

In *Wiltshire*, even the Plains of *Salisbury* of late Years have been made to answer the Plough to great Advantage. The Turf and Soil is generally very shallow, lying within two or three Inches, on a scaly stony bottom. The Plains being of great Extent, sometimes they plough one Part, and sometimes another, for two or three Years, and then lay it down again with Grass-Seed; whereby, and by the help of the Sheep, it recovers gradually its wasted Strength. Sometimes they *burn-bate* it, and afterwards take from it four or five Crops. But this last Method, tho' it brings present Riches, is observed to *tire* the Soil, and put it more out of Heart than can well be recovered again in any reasonable Compass of Years; which is chiefly to be attributed to the shallowness of the Soil. By these Methods they get pretty good Wheat, though the Straw is generally slender and the Ears short.

Moorish heathy Land is observed to answer very well in the Method of *Denshiring* or *Burn-bating*; because the Soil generally, for five or six Inches deep, consists chiefly of the Fibres and Roots of the several sorts of Grasses; and it is known, that all sorts of Vegetables reduced to Ashes, and spread upon the Ground, are enriching. It cannot but be observed here with Wonder, that there should be so many heathy moorish Grounds near *London*, the Mistress and Encourager of Arts, yet unimproved and uncultivated. What have *Hounslow* and *Black-Heath* done, that they should lye neglected as a Spectacle of the Husbandman's Disdain? The *North* have already set a better Example, and in a little Time we shall not have such a Reproach left amongst us.

I need not say, that all hazelly red mixt Earth, approaching to the Nature of *Loam*, of which there is so much to be found throughout the Kingdom, is peculiarly good for all sorts of Grain, and will endure the Extremes of Heat and Cold, Wet and Dry; and therefore is very much desired, and eagerly sought for by the Farmer, as what gives him Riches without any extraordinary Labour or Charge.

If a Man would be curious to know what Quantity of Sand, (for some I take it for granted always is) may lye mixt with his Clay, the Experiment may be easily made by dissolving a Piece of Clay in Water, still separating and pouring off the thick into another Basen till all is gone but the Sand; which when dry will be observed to run like Hour-Glass-Sand, and will ordinarily prove to be in Quantity about a *fourth part*.

Of DUNG, its Nature and Use for the Improvement of Land, and the several Sorts of it.

DUNG is to be esteemed, in a great Measure, according to the Food eaten, and the manner of Chewing and Digestion: For it is in a healthful Body that part of the Food which is gross, and not fine enough or fit enough to enter the Vessels for the Nourishment of the Body; and also what the Blood casts off by the Gail, or other Passages; also it is likely that some of the more viscous Parts of the Spittle holds it together, and goes quite through with it.

If this be the Case, it must have some Salt in it; and when Dung is burnt to Ashes it will make a Lee, from whence by Evaporation may be made Salt; and this Salt will imbibe Nitre, as may be seen by divers Preparations of Nitre with Lime, &c. as *Alkalies*, and Salt or *Sal Gem*; which two last I take to be the same; and by their imbibing of Nitre it is thought that Land is fertilized. But its chief Use is for annual short-lived Plants.

Dung will, when dry, burn; witness the Cow-Dung, gathered by the Poor for that purpose; and from it may be made Chymical Oil, which plainly proves it to have some Sulphur left.

Now a great deal of Difference from Dung may arise, by reason of the manner of Chewing. Those Beasts that chew finest, and void it in smallest Quantities, leave the most Superficies, whereby most Nitre may be attracted: And for this Cause I presume it is, that the ingenious Mr. *Evelyn* so much commends the Dust of Horse-Parths, and powdered Dung or Earths. And I believe the generality of Dungs are esteemed as thus qualified, except where the manner of Food makes an Alteration. For I doubt not but the

Dung

Dung of Cows, by reason of their Chewing the Cud, is preferable to Horse-Dung, especially where the Horses eat only Grass, as do the Cows, and exercise no more; unless the Form alters it. But if Horses eat Hay, or Oats, which is Food contracted and quitted of its watry Nature; it is then preferable. And Dung of Fowl, that live on Grain, is before that: And I do not doubt but Dung of Fowls, such as are Flesh-eaters, is better than those; for which Reason the Dung of Men, Dogs, and Swine, that live on Flesh, are esteemed stronger than most other. And notwithstanding Swine's Dung causes Weeds, as is generally said, it is probably from the same Reason, that the Corn in *America*, when the *Spaniards* first went there, grew to a Pike's Height; that is, it makes the Ground *too rich*: For if it is fertilized for Weeds, it will be so for other Things more useful; and if it be *too good*, it must be allayed with Earth, or some more barren Compost.

Mr. *Evelyn*, in his Notice of Dungs, has the following Observations. With the Microscope he examined Neat's Dung, which appeared to be Straws held together by a slippery Mucilage, and sprinkled with a Gold-like glittering Sand; but on washing nothing appeared but Straw. Sheep's Dung, when washed, he found to be short Grass. Swine's Dung was like dirty Bees Wax, mingled with Straws and Husks, which seemed like Candid Eringo, and some like Angelico Roots. Horse-Dung, like Wisps of Hay, and little Straws. Pidgeon's Dung was of a stiff glutinous Matter, easily reduced to Dust of a grey Colour, with some husky Atoms after Dilution. Dung of Poultry was so full of Gravel and Sand, that little else appeared, save some black and white viscous Matter twisted; but it smelled the worst of all.

Although the Use of Dung towards Vegetation is not perhaps thoroughly understood; yet that what does most apparently seem to vegetate Plants is *some Salt*, I suppose is generally agreed: All our Composts are studiously made of Substances which most ingender or attract Salt. Therefore, it is the nitrous Grounds of *Jamaica* and other Places, which cause so stupendous a Growth of Plants and Trees.

After a great deal said of Salt by Mr. *Evelyn*, he declares it to be, not our common Artificial Salt, but a more Unctuous Spirit or Airy Nitre, pregnant with a vital Balm, which is the Thing he endeavours to find in these Materials of Composts: And he believes that were Nitre or Salt-Petre to be obtained in Plenty, we should need but little other Composts, to meliorate our Ground; since whether that which so fertilizes it, by any Mixture we can yet devise, effects it from any other Cause, is greatly to be doubted. For which Reason, in several Sorts of Liquid Composts, he advises *Nitre* to be added, as an extraordinary and necessary Ingredient to vegetate Plants.

From what has been already observed, it will hardly be denied but that most of the Materials used for Improvement of Land, do rather do it by sending earthy Particles into the Plants, by the help of Nitre; and the Spirit of the Air and Moisture they receive from without, perhaps is more useful than any inherent Quality within themselves.

The Nitre or Spirit of the Air, which flies about here and there as the Wind directs it, where-ever it finds a kind Matter fit to receive it, there it abides till the Dews and Rains wash it in; so that it makes a Fermentation and sets the Terrestrial Matter afloat, in order to penetrate the Pores of Plants for their Growth and Increase.

Now those Materials that are most ready to receive this Nitre, are what we call the *best Dungs*. Horse-Dung, when it makes a Hot-Bed, does not do it so much by its own *Natural* as *Accidental* Qualities; for the Difference of the Parts, *viz.* Dung, Urine, and Straw, make a great Ferment, which warms the Juice in the Plant; which makes it arise as in an Alembick; and that being gone, it draws in the other Moisture about it, and so goes on while the Warmth lasts, and makes the Plant grow greatly: And to force this the more, sometimes is added Unslaked Lime; which, by pouring Water on, will flake and cause a great Heat, and so carry on the Growth of the Plants. This indeed seems as if Water with Heat was the Cause of Fertility, without Nitre.

But those Gardeners that could by Fires, Stoves and Tanner's Bark, raise what Flowers and Fruits they pleased at *Christmas*, and imitate the Heat of any Country or Season, have confessed, that after all their Endeavours (except the Plants were opened at Top to enjoy the Weather) they would not thrive; which plainly proves, they must be kept from Suffocation, or helped to something from the Air; and that Heat and Moisture alone would not do. Horse-Dung, by its violent Ferment, rots; and by so doing, evaporates a great deal of the Moisture of the Urine, &c. that was in its empty Spaces; then the Air with its nitrous Particles gets in, which is washed out again by the Dews or Rain, and with them is carried to its Growth or Augmentation.

The Sun something hurts Dung, but the Rain doth more; for it fills it, so that it is not capable to receive so much Nitre as otherwise; altho' some Wet and some Dry rots and prepares it the better: And this is the Good it does when ploughed into Ground.

There are variety of Ways of Dinging of Land, besides the Dung of Pidgeons, Hens, Swine, &c. Rags, Soot, &c. The Suds made with Soap and Blood are of excellent use for the Husbandman and Gardener; and are often applied to the Roots of Vines, Fruit-Trees, and several other Vegetables. Soap-Suds will make Plants thrive very much; and the Reason for it is, that some of the fine Salt of the Pot-Ash, with which the Soap is made, may be imbibed into the Plant; and with the Particles of Lime that may be there, are great Recipients of the aerial Nitre.

It is for the same Reason that the Ashes and the burning of Stubble or other Vegetables, does fructify Land: And I prefer the Ashes of Vegetables before Soot; for the Ashes we certainly know will emit Salt, and the Earth of them will imbibe a new Matter, as Earth from whence Salt-Petre is extracted will be impregnated with Salt-Petre again in a few Years; but Soot, though the Water when heated upon it by the Sun may possibly draw from thence some Oil, (as we see hot Weather does from Coffee so prepared) yet I cannot learn that fixed Salt can be extracted from Soot, till there be a higher Calcination; nor then, but in small Quantity; for the fixed Salt draws Nitre most: And the Spirit of Soot is drawn from a Retort filled with it, and placed in an open Fire; by which means the Soot is farther calcined, and must leave its Salt behind till extracted by a watry *Menstruum*, when the Salt will draw the Nitre of the Air.

I do not by this mean that Soot has no Virtue; for by its burning it must be more porous than Wood, and so imbibe more; but when the Oil, by the Heat of the Sun or actual Fire, is extracted, it is more porous still, and will attract stronger than before: And, as I have already hinted, I believe that these Ashes, or its Parts, of Salt and *Caput Mortuum*, Lime or Earth made dry by the Sun, do draw into their Pores the Nitre of the Air, which is again washed from thence by the Dews and Rain; all which help to convey Terrestrial Matter to the Roots of the Plants, where they with other Moisture, are sucked in; and from thence rise to the Top, by reason of the Sun's making, as it were a *Vacuum*, after the manner as Water rises in a Pump, and the finest Parts by the pressure of the Air are driven through the Pipes, till all evaporates to a dead standing Plant; and then by new Fermentations it rots, and the thinnest is driven again till the whole is brought to its first Principles; whereby, after the same manner, it helps to make the other Plants.

By Consideration of what has been observed, it is easy to apprehend the Reason why Soap-Ashes are so much coveted by the Husbandman, and esteemed one of the best bulky Manures that are known: They are greedy for it, and mix it with Chalk, Lime, other Earth, or all, that a great Part of their Land may have some.

I have mentioned Nitre often, in my Observations on Dungs, believing it to be the Foundation of Husbandry, which I would gladly bring to an Art: But Experience is still the best Guide.

Dungs are used very often in Medicine, and commended for the easing of most sorts of Pains. Dung of Stone-Horses is pressed, and the Juice drank for Cholicks; that of Dogs is taken for Quinsies or sore Throats; for Dogs eating Flesh, their Dung abounds with volatile Salt: Man's Dung we have an Antipathy to; but by reason of his continual Flesh-eating, it is the strongest of all, but not the best for Use, by reason it breeds Worms, and therefore is hurtful to Trees and Plants. In Retorts, Volatile Spirits may be drawn from Dung as well as Urine.

If Heat and Moisture alone, and a freedom for Plants to breathe in, were sufficient, Dungs and Lime for Ground would not be needful. But Dung till Calcination, or perfect Rottenness, will afford little or no Salt; and Lime no Salt at all. And therefore if they do not imbibe the Nitre or Spirit of the Air, I do not see how or which way they can be useful, in the Improvement of Land.

Having thus far treated on the Nature of Dungs, and their probable Operation and Influence on Vegetation; it will be necessary to be a little more particular in treating of the different sorts, their Use, and the several Methods of applying them for the Improvement of Land.

I think it may be laid down as a just Position and Maxim, that *Whatsoever bath active Parts in it, if it be not just of the Nature of the Ground, will raise Improvement*: Heterogeneous Things, upon their Meeting, causing that Buffle and Stir, which is thought by most Naturalists now to have great Influence upon Vegetation. The general Art there-
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fore of Improvement, is to adjust all Superinductions to the Nature of the Soil. Hot and dry Things are to be apply'd to cold and moist Land. And, on the contrary, cold and moist Things are to be apply'd to hot and dry Land. To say, therefore, that this or that Dung and Compost is best for all Improvements, is like a Catholicon in Physick, good for all Constitutions; which among Physicians is accounted an Absurdity. Reason and Philosophy, join'd with Experience, must then be a Guide to Practice.

There are two general (tho' not the only) Misfortunes which are the Causes of great Barrenness in Land, in the two Extremes; *viz.* Too great Moisture, and too great Dryness. For, as too much Moisture is an undoubted Cause of Sterility, so too much Dryness is the Occasion of Poverty in Land; the Consequence of most sandy and gravelly Soils, as the other is of too strong and stiff a Clay: Tho' it may not be amiss to observe by the way, that cold wet Grounds are much more easily fertilized by draining, than hot Soils can ordinarily admit of by drowning and watering. Let us then try what proper Remedies may be apply'd to these two Extremes, before we proceed to treat of other general Improvements proper for Land.

1. To prevent Sterility occasioned by too great Moisture, either by Reason of a stiff untractable Clay, or by Stagnation of Water, it will be as easily imagined as allowed of, that *Draining* must be the original and most effectual Cure. For tho' Water and Moisture are absolutely necessary for Vegetation, yet it is manifest in Experience, that *too much* is as bad as *too little*; inasmuch as Bogginess and Obstructions of Springs, more or less, are generally the Cause of that cold Chilliness that affects some Lands, breeding Rush, Flags, and other useless Trumpery; and therefore, the Foundation of the Cure, and Improvement expected, must be to remove this internal Cause, by laying the Ground dry, and draining the Bog.

All I think agree, that Trenches and Outlets are the only Cure, and absolutely necessary for this Purpose; tho' there have been great Diversity of Opinions in the Methods of working and forming these Trenches. After all that I have seen and experienced, relating to the forming Trenches and Outlets; the following Method I have found to answer the End best, and seems to be the easiest and most natural. If the Bog hath any Declivity, begin at the lowest Part to open a Trench three Foot wide, and work upwards till you come to the Foundation of the Disease, the Spring-Head; where also you must make such Trenches, either round or cross the Bog, as you shall find necessary to drain it thoroughly: But be sure to go deep enough, and repeat the Trenches as occasion serves. The more Trenches, the more secure you are of a Drain. Let the Trench be cut at least a Spit below the Spring, or else all your Labour will be in vain. Some content themselves to leave the Trenches open, and repair them as Necessity requires. But in that Case, I advise that the Earth taken out may not remain on the sides of the Trenches, but be carried farther off, so as to fill up any hollow Places. However, I cannot but think it advisable (the Charge and Labour not being great) to throw in a convenient Layer of *Green* Wood, Elm, Sallow, or Willow-Branches, and upon that to lay the outward Turf, the Sward downwards, and so fill it up to a Level with what remains.

This, you'll say, seems natural and easy enough. But the great Difficulty of all is to drain a flat Bog or over-wet Ground, lying most part of the Winter under Water for want of a Descent or Declivity to carry off the Water. I have never yet seen any Remedy prescribed for this Case, but what has been more Charge than Profit. But if we cannot gain all we *would*, we must gain all we *can*: Therefore the wisest way is, to be willing to lose some to get some. Mark out then a square Piece (in the dryest Season) in the middle of this Flat, bigger or less according to the Quantity of the Ground, and dig it six or seven or eight Foot deep, dispersing it all over the Flat, whereby the whole may be raised so as to keep its Head above Water. For so many Inches as you rise in Height, just so many Inches do you get towards a Drain. And to some perhaps it will be thought no small Acquisition, that by this means they have gained a Fish-Pond.

2. Let us now then proceed to say something of the other Extreme, *viz.* Sterility, occasioned by too much Dryness, the Effect of most sandy and gravelly Soils; in regard that they retain not the Rain-Water so well as Clay, or Land of a mixt and loamy Nature. One, and indeed the most proper, Remedy for this Defect, where it can be had, is artificial Watering; which tempers the Ground, and sets the Salts in Motion for the speedy Improvement and Growth of most useful Plants, Grain and Grass. For as Water (being always more or less mixt with Terrestrial Matter) is properly a Soil, and hath
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an exceeding Agreeableness to the Bodies of most Vegetables; as appears by Experiments of their Growth in Water only: So there is likewise a very considerable Advantage gained to dry, sandy and gravelly Earth, by the fat and unctuous Wash that is carried along in Land-Floods, and Currents of Water, that having passed through Cities, Roads, and soiled Places, do strangely impregnate where-ever they are dispersed: Infomuch as the Salts, and other mixt Soil carried away by the Flood, naturally and gradually subsiding, are left behind upon the Land; which mixing themselves with the Sand, Gravel, and other heterogenous Bodies unlike themselves, do, by the Help of the Sun, cause that Motion and Circulation of the minute Parts of Terrestrial Matter, which by Naturalists is now generally thought to be the Life of Vegetation, and the true Cause of the Increase of Plants.

Where therefore the Situation is so happy as to admit this great Advantage of drawing the Water over the Land, and turning it off at Pleasure, the Use of it should by no means be neglected at the proper Season. And there is no great Difficulty in the doing it; when once a Discovery is made where the Water may be conveyed, so as to answer the general Purpose. Cut out the Master-Trench, or Water-Course, to such a Bigness as may contain all the Land-Flood; when the Water is brought thither, carry it in foot-broad Trenches all along the Level; and if there be discovered in these lesser Trenches any Mistake or Failing, it may easily be mended, by going higher to or lower from the Level, whilst for a time the first Trench be stopped up again. This done, the Water-Course must be cut out large enough to contain the whole Water intended for the Improvement of the Land. And this Largeness ought to consist in Breadth, and not in Depth; for a shallow Trench about a Foot deep is best for this Work. Only observe, when the Trench is brought near to an End, it is to be brought narrower and narrower.

The Time for the Operation of this Improvement, must be when the Grass is not much grown; that is, in Winter, or early in the Spring. Only you must observe, to let the Water dry in before you repeat the drowning, and not to let Cattle poach it; for too much constant Wet rots and poisons the Roots of the Grass, especially in such Places where it stagnates. By this very Improvement, we have Instances of Land raised in Value from Eighteen-Pence to Thirty Shillings an Acre.

But yet at the same time it should be also noted, that there are some Springs, whose Waters are rather injurious to Land, and hinder Vegetation; such, for Instance, as flow from Coal-Mines, or any Chalybate or sulphurous Mineral, having harsh and brackish Qualities hurtful to Vegetables. However, I cannot but think that even these Waters would make great Improvements, if discreetly and sparingly used, and at such proper Times too, when other Quantities of Water might be contrived to mix with them.

But this Improvement by Floating is a Felicity not every where, and indeed but in a few Places to be obtained. Therefore it will be necessary to point out what Helps may be had for hot and dry Land, where the other is wanting. Let it then be remembered, that the most cooling, moist, and proper Manures for hot and dry Ground, are Cow-Dung, Marle, Clay, Chalk, but especially Mud taken from the bottom of Ponds; the Excellency of which is not sufficiently understood, and therefore not used so much as it ought: For whether the Improvement of warm Land kept in Tillage is intended, there can be nothing better to lay on the Fallows than Mud out of the bottom of old Ponds spread abroad at *Midsummer*; or if it is to improve warm Pastures and Meadows, nothing will better or sooner answer the End, if used in the *Autumn* or *Spring* after 'tis mellowed by the Frost. For it not only fertilizes such sort of Land, but prevents, in a great measure, the dismal Effects of a succeeding Drought. The Nature and Excellence of the other several Dungs, Manures, and Improvements, I shall speak of distinctly by themselves, that they may be used with Knowledge and Discretion.

Of the several Sorts of DUNGS strictly and properly so called.

HORSE-DUNG, when taken fresh from the Stable, is of no other Use, but to give a breathing sweating Heat to all tender Plants sown in a convenient Depth of Earth laid upon its Surface. But its Use and Advantage in the way of Hot-Beds, I shall speak of in a Place by itself. Therefore when I speak of *Horse-Dung* here, it is meant such as is laid in Heaps to rot for Manure and Improvement: And this is by all agreed to be one of the best Dungs for general Use, but especially for such Lands as are not over-hot of themselves; and in that Case it should be used discreetly, and mixt with other cooling Dungs, such as Cows and Hogs Dung, or else Chalk and Mud. The more it is rotted, the better it is for Use, and the easier carried abroad. I cannot therefore approve of a common slovenly Way of using it in many Places, where they suffer it to be made as a Bed in the Farm-Yard for Cattle to lye on. Whereas the oftener it is stirred, and the hollower it lieth, the better for rotting. For which purpose, about *Christmas* it should be built up in square or round Heaps, and the Walls of it made perpendicular, to keep Hogs and other Cattle off from treading it; and so the Residue, as it continues to be made either from the Stable, or the Cows or Hogs, is to be thrown upon that Heap, which will continue to give it a daily Fermentation. And this Heap of Dung, should, if possible, be made in some Pit or hollow Place in the Yard, that the Rain-Water passing through it, as well as the Urine from the Horses and Cows, (which by some are thought to be the richest Manure) may be preserved and kept from running off. By this means the whole Dunghill will be so rotted by the following *May* or *June*, the Time for carrying it abroad, that it will cut with the Spade like Mud, and carry with it an abundant Fertility. Many content themselves to spread it in the Summer as they carry it out: But others, who will be at some Pains for better Improvements, lay it on several little Heaps on the Fallow Land, and spread it afterwards before the last Ploughing. Twenty Load of this Dung is abundantly enough for an Acre; and it is singularly good for Wheat and Barley. If more is laid on, it makes the Land run to Weeds, and the Corn to Straw; therefore this middle Proportion is best, because it is supposed to be renewed once in Three Years; except the Land be well folded with Sheep alternately, which indeed is the most adviseable Method.

There needs little to be said of the Use of *Cow-Dung*, having already advised the mixing it as above, and described its Nature. *Hogs-Dung* heretofore was not much valued; but now it is known to be a strong and most excellent Manure for almost all Sorts of Land, especially the hot and dry. By throwing the Refuse of Garden-stuff, into the Hogs-Court, several Loads of the best Dung may every Year be made; which, beside the Advantage of feeding the Hogs, brings no small Profit to the Farmer. But in some Parts, on poor light shallow Land they sow a small white Pea, which they never gather, but turn in as many Hogs to eat them as they think will be fat; and there they let them lye Night and Day, whereby their Land will be so enriched with Dung, that it will bring a good Sward upon it, and graze well many Years after.

The Dung of *Sheep* is undoubtedly a rich and valuable Manure, and highly prized by those who know how to use it; especially in all cold and stiff Lands. But it is to be observed, that it is much better for Tillage than Pasture; accordingly the Husbandman thinks he cannot do well without it. But because it cannot be so conveniently gathered together in Quantities as other Dung, it is commonly conveyed by folding the Sheep themselves thereupon: By which means both the Urine and the Dung is saved; which ought, as soon as possible, to be turned in with the Plough, lest it be exposed and weakened too much by the Heat of the Sun. In many Places they fold their Sheep on Rye-Lands after the Rye is come up, rightly judging that the fresher the Dung is, the more it fertilizes; and though it should seem that the Rye is much damaged by the treading and Layer of the Sheep, yet it is found quite otherwise. In the open Fields the Manure arising from the Sheep is valued as much as the Wool; and I cannot see why it should not be used the same Way amongst Inclosures, folding the Sheep at least all the Summer on the Fallows, and driving them again to their Pastures in the Day-time; where the want of that Manure may be much easier and with greater Advantage supplied by Cart-Dung proper and suitable to the Soil.

A stronger Sort of Dung still, and much fuller of Nitre, is that which is taken from the *Dove-house*; the Dung of *Pidgeons* being of so strong and hot a Nature, that if it be only sowed upon a Crop of Corn, and Rain succeed to put the Salts in motion, a wonderful Increase may be expected even on the most barren Land; and it hath the same Effect on

Meadow-Ground for Hay. Twenty or thirty Bushels will sow an Acre, which is a very convenient Improvement, where Land lieth at a distance, and where other Manure cannot conveniently be carried; only it is to be observed, that it answers but for one Year, the greatest part of its Virtue being lost the second.

The Dungs of other Poultry are all proportionably good and nitrous; though none of them so strong as Pidgeon-Dung. I had a Curiosity once to try the Strength of Dungs by the help of the Microscope, which answered my Expectations very well. Thus: I dissolved a small Quantity of Salt-Petre in a spoonful of Water; what the Point of a Needle would take up from thence, I laid on the Glass, and found by one of the least Magnifiers a multitude of transparent Columns of Chrystal of different Magnitudes, lying some parallel and some transverse, affording in the whole a pretty and beautiful Sight. Then I dissolved the same Quantity of Pidgeon's Dung in the like Quantity of Water, expecting to find something of the same transparent Chrystals; which accordingly were manifest to the Eye, though smaller and fewer in Number, because mixt with other gross Matter. I repeated the Observation with the Dung of Poultry, and found here and there some small confused ChrySTALLINE Matter; the Quantity whereof was yet plainly less when I came to examine the Strength of Horse and Cow-Dung. I went no further. But thus, I think, may plainly be discovered the proportionable Strength and Virtue of all Sorts of Dungs.

Concerning other MATERIALS to be used as Helps for Vegetation, and proper for Improvements.

THERE is no manner of Question to be made, but that all Sorts of Soils and Earths, of what Nature soever, may be made more fertile and fitter for Vegetation than naturally they are, by mixing therewith such proper Materials as are found by Experience to help and assist the Powers of Nature; inasmuch as if they are rightly chosen, they agitate and set in Motion such minute Parts of Terrestrial Matter as give Life to every Plant, and thereby giving it a Power to continue and increase its own Kind and Species. The whole Art of Agriculture depends upon this: Inasmuch as when the Nature of the Soil, and the Quality and Quantity of all adventitious Materials to be superinduced is thoroughly understood, the whole Mystery of Vegetation and Improvement is made plain, easy and familiar. For which Purpose, I cannot but recommend, what I think is universally agreed on to be most agreeable to Reason as well as Experience, *viz.* the Ashes * of any manner of burnt Vegetables; for by such Burning is wasted the more phlegmatick and useless Moisture, and at the same time are fixed the more solid and substantial Parts of Vegetable Nature. This Effect the Fire is observed to have on the Turf or Surface of the Earth full of Roots and Fibres. For the oily Matter, that is left by the Fire in a moderate proportion applied to any Earth, highly enriches it; as appears by the vulgar Experiment of *Denshiring* or *Burn-bating* of Land, which by that means yield so fair Crops of all Sorts of Grain. In which Operation the Rustick observes, that over-burning the Turf is rather injurious than helpful: Which is exactly agreeable to an Observation I have made in *Wiltshire* upon *Salisbury Plain*. For where they have happened to lay up the Turfs in too great Heaps, the excessive Fire and Heat required to reduce them to Ashes, hath been nicely observed to *over-burn* the Earth; inasmuch that the Salts or Spirits, so necessary to Vegetation, and so much sought for by that Practice, plainly evaporate and fly away; which yet a more moderate Heat, by laying the Materials on lesser Heaps, would prevent, and the Husbandman's Expectations would be better answered. For indeed, the Reason is plain, as was hinted before; In the burning of any Vegetable, a gentle, easy and smothering Fire doth not waste the volatile nitrous Spirit so much as a quick one; but causeth much more of it to fix and remain behind.

Fixt Salts, that are thus obtained, are the grand and principal Treasure so much sought for and celebrated for Improvements of Land, to render it more fruitful; although there are many other Salts near in Affinity to these, that do also greatly meliorate and fertilize the Earth. As, for instance, *Rags* of all Sorts, as well Linnen as Woollen; as also Shreads of Leather, old Shoes, Hats and Stockings. All these refuse Things, generally thrown away as worth nothing, have a marvellous Virtue in them for fertilizing Land for Corn; especially if they be cut into small Pieces, and strewed upon the Fallows. One Load of these refuse Things is valued by the Farmers in *Hartfordshire*, as worth more than Ten Load

* *ne pudet*

Effatos cinerem immundum jactare per Agros. VIRG.

of the best Dung; and accordingly they fetch them at a great Expence from *London*, where they can get them in Quantities. I have often wondered to see them lye neglected in such populous Places as *Newcastle* and *Sunderland*, even to the great Annoyance of the High-Ways; from whence yet the Farmers fetch Dung from all Quarters, at a pretty great Expence. It is to be hoped they will soon grow wiser, when once they come to understand such Wisdom will make them rich. Besides these, there are a great many other refuse Things, which contain in them a rich fertile Salt. Ashes of all Sorts are very good; but the best are those from the Sea-Coal, especially for cold Land, and the Meadow or Pasture-Ground; for it is observed to have a strange Property of making the Soil run much to Clover-Grass or Trefoil, which of all others is the sweetest and the richest Feed for Cattle. Throughout the whole Bishoprick of *Durham* (one of the finest, I think, and richest Counties in *Great-Britain*) there are vast Quantities of these Ashes made, on the Account of the great Plenty of Coal-Mines found therein; of which I shall speak more in its proper Place. But whereas every, even the meanest Family, is supplied and refreshed with plenty of Fuel at a trifling Expence, the Ashes of Sea-Coal are made in such great abundance, that it is surprising to observe what Riches, what vast Improvements have of late Years been made all over the Country, since they came to understand and experience the fertilizing Nature of these Ashes. But indeed, the late Improvements are still much greater near all populous Places along the Sea-Coasts, where great Quantities of Sea-Sand are made use of by the cleanly Housewives: For *That* mixing with the Ashes and other Kitchen and Stable Dung, not only increaseth the Quantity, but also improves the Quality, heightening and fermenting the fertilizing Nature of Both; agreeable to that Maxim already laid down, *That heterogeneous Soils or Dungs, and Soils of the most contrary Nature, are most proper and most necessary for Vegetation.*

But indeed *Sea-Sand* is of itself a noble Manure for all Clay cold Land, having a double Influence there, by adding to the Salts of the Earth; and as it separates the Parts of the Clay, helps to put those Salts in Motion. Wherefore it is very advisable to fetch the Sea-Sand from such Places, where it has been lately overflowed with the Tides, while it is yet moist and well impregnated with the Salt Water; and not from such Places, where it has lain some time dry, and is become *slippery*. The not observing this, hath been the Occasion of great Disappointment to the Farmer's Expectation. For barren Sand, though it may be good to separate the Parts of a Clay-Soil, that of itself is rich enough, and so dispose it for Vegetation; yet it will not fertilize hungry Land, except it be well impregnated with Salts, or with something analogous to it, *viz.* Nitre, Sulphur, or some fat unctuous Wash of Earth.

This is that which makes what is commonly called *Drift-Sand* so very valuable; that is to say, all such Soil and Sand as is wont to be driven on Heaps in Brooks, or Rivers, by Land-Floods in the Winter or Spring; which being forced from the Surface of the Up-Lands, either Tillage or Pasture, impregnated by Manure or Dung of Cattle, hath an uncommon Fertility in it; and therefore should be highly prized by the Husbandman, and carried in proper Season to such Up-Lands as most want it.

Sir *Hugh Plat* recommends the Use of Soap-Ashes after the Boilers have done with them, both for Corn and Grass. The common Allowance is eight Load to an Acre; and if it is laid something thick where Furze, Broom, and Fern grow, it is thought it will entirely destroy them, especially if applied after grubbing at *Midsummer*.

Soot is, I think, generally agreed on to be a good Manure for all cold Lands, and it is equally good both for Pasture and Tillage. Forty Bushels laid upon an Acre will do Wonders, especially if it be Soot from Sea-Coal, which is much the strongest and fullest of Nitre.

Malt-Dust is another great Improver of Land. And upon a Crop of Barley, which is observed to be weak and faint in *May*, if it be sowed by the Hand, as they do the Seed, it will give a strange Life and Increase to it, especially if Rain follow. It seems to be near as strong, and to have the same Effects, and consequently should be used much in the same manner as Pidgeons-Dung. Forty Bushels of it may be allowed to an Acre; but you must expect the Advantage only in one Crop.

Tanners-Bark, Saw-Dust, Fish, Flesh; Bones, Hair, Horns, Hoofs, and Skins of Beasts, are all generally known to add very much to the Improvement of Land, laid on in due Time and Proportion. And there is one Thing more which I cannot but mention, as containing a great deal of Salt, and therefore an Improver of Land; and that is, Sea-Weeds of all sorts, but especially what is generally known by the Name of *Wear*; of which by Burning they make *Kilp*, the chief Ingredient now of late made use of for making *Glass*. This *Weed* is oft-times of a large Substance, growing chiefly on such Rocks as are covered

red at High-Water, and from thence is washed by the Waves on the Shores in great Quantities. From whence it might easily be gathered in Heaps, and carried away to the neighbouring Fallows, to the great and almost incredible Improvement of a single succeeding Crop of Wheat or Barley.

All these Materials before-mention'd as proper for Improvements, are still *further* improv'd by discreetly mixing them together, and by giving them a seasonable Fermentation; and if Convenience and Leisure permit, the best way is, near the House and in the Farm-Yard, to make a Pit in Length and Breadth according to the Quantity of Soil, paving it with Stone or Chalk, that it may detain the Moisture of the Dung in order its better Rotting and Fermentation. And because over-much or hasty Rains are apt to carry away the Salt of the Dung with it, which is the chief cause of its Fertility, it will be proper to lay it as thick on Heaps as may be, rounded at the Top like an Egg, covering it also with Turf to prevent the Sun and Wind from exhaling and drying up its Virtue. For the well *preparing* of Dung, and the *Increase* of its Quantity, is an Art that ought to be well studied by the Husbandman, as a Thing of the last Importance towards the enriching both himself and his Farm: This being a certain Truth, that the Encrease of the Crop will make an Encrease of the Dung; and so, on the contrary, a Decay and Failure in the Dung, makes a Decay and Failure in the Crop: And therefore (always including the Blessing of God) the Whole of the Profit, and the Value of the Farm, depends upon a due Care of those two Points.

It will now easily be thought that I have hitherto forgot some material Articles relating to Improvement, and such too as have been found by repeated Experience to be great Helps both to the Grazier and the Farmer. But I have chosen to reserve them for *Chapters* by themselves, because their Nature and Use is something more difficult and intricate; and yet deserve to be thoroughly understood.

Of LIME.

IT is not many Years since *Lime* was brought into so great Repute, and become of such general Use in the Way of Husbandry and Improvement of Corn Land. But it is now so well understood, and so much coveted, that the industrious Farmer thinks almost no Pains or Cost too much to procure it. But neither is the Knowledge and Use of This become so universal as it ought; and therefore I shall briefly describe its Nature, and recommend its Use, where it can be had at any tolerable easy rate, as being so noble an Improver of Tillage. Lime is commonly made of Chalk, or of any Sort of Stone, that is neither sandy, nor porous and cold, as Free-Stone, &c. All Sorts of grey Stone, such as, if you break it, will yield a white Powder; all Sorts of Marble, Alabaster, Slate, Oyfter, and other Sea-fish Shells; as likewise Flints will make an extraordinary Lime, though they be hard to burn: For the harder the Chalk and the Stones are, the better is the Lime. All sorts may be burnt with Wood, Coals, Furze or Fern. And such is the Felicity of the County Palatine of *Durham*, that through the very Middle of the County runs a large Vein of the best Lime-stone in *England*, generally pretty easy to win, and at the same time the best Coal in almost every part to burn it with. Chalk is commonly burnt in twenty-four Hours; but the right Lime-stone oft takes up sixty. This Last, as it is best for all other Uses, so it is observed to be best for Land; chiefly for light sandy Soils, or loamy mixt Gravels. It is carried upon the Fallows in Summer, and laid in small Heaps till Rain comes to dissolve it; and then it is spread abroad. Some mix Mud or fresh Earth with it, and sometimes Cow-Dung; all these tending to fix and stay the Salts contained therein. Those that are most acquainted with the Use of it, generally allow a hundred and fifty Bushels to an Acre; but its Nature being to work downwards, as Chalk, it will not last above four or five Crops; and therefore if there be any Declivity in the Land, it is advisable to lay the Substance of it chiefly on the upper Part; for it will much of it soon wash down to the lower.

Of late Years, many of the Moors and waste Grounds in some Parts of the Bishoprick of *Durham* and in *Northumberland*, that were thought cold, barren and good for Nothing, are now turned into Arable Land; and so far improved by Lime and Inclosures, that what was not worth above *One Shilling* an Acre, is now become worth *Twenty*. And after having said this, I think I need not add any thing farther to recommend the Use of Lime, although it should be fetched eight or ten Miles off.

Of CHALK.

WHEN I speak of *Chalk* here, I mention it not as a Land itself to be improved, but as a superinduced Soil and Manure for other Land of a contrary Nature. There are several sorts of *Chalk* for several Uses: Some are so hard and so little apt to dissolve, that they are by no means proper for Land, till burnt into Lime; the excellent Virtues and Properties whereof you have already heard. However, there are other, and those the more general sorts, that are more unctuous and soluble; which being laid crude on Lands, either Pasture or Tillage, when once dissolved by Frosts and Rains, cause great Fertility; especially on such Lands as are apt to lose the Riches of Dungs laid on them, and to forget in a little time that they have had any kind and indulgent Benefactor. Here *Chalk* is of excellent Use to drive away such Ingratitude, having a retentive Quality to enclose and stay the Salts. According to which Observation it hath been also found, that if Land, which is chalked, is not at the same time kept in Heart by a mixture of Dung, it will receive but little Benefit by repeated Chalking: So that tho' for a time it may make the Tenant *rich*, yet it may so happen that it will make the Landlord *poor*. For which Reason, the most approved Practice for a *lasting* Success, is to mix a convenient Quantity of rich Earth, or Dungs of Animals, or Vegetables, laying all together up in Heaps to ferment and incorporate. One Load of Chalk to two Loads of Dung, or other rich Earth, is a much better and more lasting Manure than Dung alone; especially for all cold, sour, gravelly Land, where it will cause an abundant Fertility. On Tillage it will produce incredible Crops of Corn for several Years together, if about twenty Loads of the aforesaid Composition be laid on an Acre; and when the Time of Tillage is expired, twenty or thirty Load of Chalk alone will do Wonders upon an Acre of Meadow or Pasture; having with it that singular good Quality of sweetening the Grass, thereby causing all sorts of Cattle to thrive and grow fat speedily, as well as Cows to give sweet and thick Milk.

Mr. *Mortimer* tells us of a good saving way of digging Chalk in *Kent*, which it may not be amiss to inform the Reader of, *viz.* where they dig it on the sides of Hills, they undermine the Bottom of the Chalk so far as they would have it fall; and upon the Top, so far as they have undermined the Bottom, they dig a small Trench, which they fill with Water; which in about a Night's Time will soak to the Bottom, and cause a Flake from Top to Bottom to fall the Breadth of the Place undermined; which saves a great deal of Labour and Danger: But as Chalk in most Places lieth a great Depth under the Earth, there they commonly dig for it in the same manner as the Miners carry on the Shafts of their Mines, and draw it up with Buckets.

N. B. What hath been said above concerning the Nature of *Chalk*, and its Use for Improvement of Land, may be applied also to most sorts of rich Clays, such especially as are apt to *fall* when well soaked with Rain. And if they are used with Discretion, and in the aforesaid Proportion laid on Land of a quite contrary Nature, they will produce much the same desirable Improvements; which yet will be better understood, when I have spoke something more particularly of the Nature of Clay and clayey Land.

Of CLAY, and CLAYEY LAND.

CLAY is one of the sorts of Earths that is useful for a great many Purposes relating both to Husbandry and Trade. And of Clay there are vast Varieties, as they are mixed with various Proportions of Sand or other Matter: A List of some of which is to be found in the *Philosophical Transactions*; and is as follows.

Fullers Earth. Yellowish, at *Brickhill* in *Northamptonshire*; and under the *Yorkshire* Woods: Brown, about *Hallifax*: White, in *Derbyshire* Lead-Mines: Boli, in *Cleveland*, at *Lanton upon Wharf*: Pale yellow, in the Marle-pit at *Ripley*: Cow-shot Clay, or the Soap-Scale lying in Coal-Mines: A dark blue Clay, or Marle, at *Tolthorp*, *Harsb* and *Dusly* when dry. *Creta*, so called, or the Milk White Clay of the *Isle of Wight*: The Potters pale yellow Clay of *Wakefield Moor*: The blue Clay of *Bullingbrooke* Pottery in *Lincolnshire*: A blue Clay in *Bugthorp Beck*, and at *Yelvertoft* in *Northamptonshire*; in which the *Astroites* are found: Yellow Clay, in the Seams of the Red-Sand Rock at *Bilbro*: Fine Red Clay, in Red-Sand Rock, at *Bilbro* and *Rippon*: A soft Chalky blue Clay, and a soft Chalky red Clay, at *Buttercrain*, *Stoney* when dry: A Red Stone Clay, in

the Banks of *Whitcar Beck*, near *Leppington*; and at *Housam*: A Blue Stone Clay, at the same Places: *Clunch*, a White Stone Clay in *Cambridgeshire*, mixt with round Sand or Pebble: The yellow Loam of *Skipwith Moor*, *Yorkshire*: A Red Sandy Clay in the Right-hand Bank of the Road beyond *Collingham*, near the Lime-Kilns: A Red Sandy Clay in the Red-Sand Rock near *Rippon*, with flat or thin Sand, glittering with Mica: Crouch White Clay in *Derbyshire*, of which the Glass Pots are made at *Nottingham*: Grey, or Blueish Tobacco-Pipe Clay at *Hallifax*: A Red Clay in the Red-Sand Rock at *Rotherham*.

This LIST of CLAYS amounts to two and twenty sorts; and doubtless there are many others in this Kingdom. The Clay most desirable for the Husbandman's Use, has in it about a fourth part of fine Sand, with a little Quantity of Salt; being an *Alkali*; endued with some Particles of Iron, which may be drawn forth by the Load-stone. Several Chymists allow the Moisture of all Earths to be composed of the Spirit of the Air about the Place it is found; and so, as it sucks in the Rain, Snow, or Dew, it sucks in all that can be carried with them; and from thence, by Chymical Art, may such Matter be extracted: Although it is probable, that the stiffer the Clay is, the less it receives from the Air; because in a great measure it resists the Penetration of Water, which with the Closeness of it, that hinders in some measure the growing of Plants through, may be the Reason of its tending so much to Barrenness. But the more it is mixt with Sand, or other Matter that keeps it asunder, (except in too great a Quantity) the more Nitre it receives, and is the more fruitful.

Exceeding thick Clay is worst for the Husbandman; but that mixed with Sand, black Mould, or other Earth, in such a degree of Stiffness as to bear Wheat, Barley, Beans, or other hard Corn, I take to be good Land, for it will dissolve and receive the Rains and Nitre; such is Hazle-Mould, which is chiefly a Composition of Clay and black Mould; and this is of such a Temper as to be tolerably good for most sorts of Corn: But as it tends more to Clay, it is fitter for the hardest Corn, as is the black Mould or Sand for the lighter; and if it be in Extremes, it must be mended by Superinductions.

The Culture of that Land which tends most towards Clay, and is called Clay-Ground, should be agreeable to the Practice of *Staffordshire*, *Northamptonshire*, and *Leicestershire*; where they keep it (if it lies in a Common Field) always in Tillage, sowing it two Years, and letting it lie fallow the third. They lay it in Ridges, or otherwise, according to the Temper of their Land; and make their Fallows towards the latter End of *March*, or Beginning of *April*, a little before the second Ploughing, which is commonly about the Middle of *June*. It is manured generally with Cow or Horse-Dung, unless when folded with Sheep; then it is immediately spread, and cast under Furrow with the Plough, lest the Rain and Sun should weaken it. About the latter End of *August* it is ploughed again to kill the Weeds, and turn up the Manure, that so they may return it again to their Seed at the last Ploughing, when they sow, which is usually the Week before or after *Michaelmas*.

The Land thus prepared is sown with Wheat, &c. as directed under *Ploughing* and *Sowing*: But if Clay or light Land be inclosed, they are capable of Improvement by Marle, especially Salt-Marle, which with Rain runs like Lime, and never binds the stiffest Clay, but looseneth, so that after eight or nine Crops it yields good Grass: Whereas Clay-Marle so binds the Surface, that though there will be seven or eight Crops of Corn, yet the Ground is ill disposed for Grass, unless well manured with Muck and Lime mixed; which some lay on a Fallow, others when they plough for Corn; either Way it will produce two or three Crops more, and so mend the binding Quality of the Marle, that the Land will yield as good Grass as if otherwise improved. If Clay be mixed with Gravel or Sand (which is not often very rich) it hath much the same Tillage as Clay and light Mould; but it is usually sown with what is called *Muncorn*, or *Miscellane*, in the Place of Wheat.

By what hath been said, it may easily be perceived that Clay laid on sandy Ground makes a great Improvement: And barren Clays may be much more improved by Sea-Sand, when managed as follows: The Land must be well ploughed and hacked, and have sixty or eighty Bushels of Sea-Sand on every Acre, well spread and mixed among it; and after that at least forty or fifty Bushels of Lime as well mixed; and then good store of Ox, Cow, or Horse-Dung, rotted Straw, Mud of Lakes, &c. which is to be done between the Beginning of *May* and the End of *September*. In *October* this Land should be ploughed again deeper than before, and also hacked and harrowed to have it fine; which done, it must be plentifully sown with the best Wheat for the first two Years; and the next (by a Folding of Sheep) with Barley; the next three Years with Oats; and the seventh it may be sown with Garden-Pease or Beans; after which, if laid down

down, it will yield good Grass. In Places where Sea-Sand cannot be gotten, *Liming* is good Husbandry, with the sowing of two Bushels of dry Bay-Salt; as also Brining and Liming the Seed.

Mr. *Evelyn* gives several Accounts of Clays, all tenacious of Water on the Surface, where it stagnates and chills the Plant; and in dry Seasons it hardens with the Sun and Wind; so that most Clays of themselves are pernicious and untractable. The Blue, White, and Red Clay, if strong, are to be sure all unkind; the stony and looser sometimes tolerable; but the light Brick Earth will do very well with most Fruit-Trees. But unmixed Clay is rightly enough called a curst Step-Dame to almost all Vegetation; having few or no Passages for the receiving of Nourishing Showers, or Expansion of the Roots, and at the same time *closing* and *fixing* the earthy Particles proper for Vegetation. The white and blue Clay (commonly the best Pasture) are worst for Wood; but the Oak will prosper in it, and for Toughness is to be preferred; for *Chaucer's* great Oak grew in a gravelly Clay, moistened with small and frequent Springs. It is by all allowed, that the Fir, Pine, Pitch-Tree will thrive mainly in a clayey Soil: But Forest-Trees ought to be set near the Surface in the moist Clays.

For mending of stubborn Clays, Laxatives are prescribed, such as Sand, Gravel, Saw-Dust, Marle and Chalk; but, above all, Sea-Sand and Burning. Many commend Rotten Wood, and Soot, and Rubbish of Brick and Lime-stones to be laid at Bottom, with Composts of Dung on the Top: By digging of deep Trenches in Grass-Ground, it will be a great Improvement of a clayey Soil; for this Land ought to lie dry for Grass. And besides what relates to Culture, Clay is very useful in such light Grounds where Ponds are wanting, and the Water sinks all away. Here, if Clay be well rammed, and upon that a good Pitching of Stones be laid, Water may be preserved to good Purpose.

As to Tobacco-Pipe Clay, a good sort of it is gotten at *Northampton*, at a Place near *Pool* in *Dorsetshire*, and in the *Isle of Wight*; where it is dug in square Pieces of the bigness of about half a Hundred Weight each; from thence it is brought to *London*, and sold at about Twenty Shillings the Tun. This Clay, while green or fresh, feels fat and slippery, like Soap, and glitters; it will fetch out Grease like Fullers Earth; and being dried before worked, and afterwards watered, it will work like Paste, from which are taken Pieces big enough to make Pipes, &c.

Clay is the usual Wrapper (mixed with Horse-Dung and Water) for Trees grafted. It makes Walls for Houses, for the poorer sort of People, being well tempered and mixed with Straw. When Coals have been dear, Lumps of Clay, mixed with the smallest Coal, have been used for Fuel; and by help of Fire it makes a great many good Manufactures.

If Clay be laid on dry to any Wound or Ulcer, it will suck up some of the Moisture, and with it some foul Matter will stick, and be taken off; and so the drier and cooler the Wound or Ulcer is, the sooner it will heal.

MARLE, its Improvement of Lands.

MARLE is not improperly called the Ointment of the Earth: For it is a slippery sort of Earth, like *Castile-Soap* to the outward Touch, and will crumble or dissolve.

We are told of five sorts of Marle; the Cowshut Marle, Stone or Shale Marle, Peat or Delving Marle, Clay Marle, and Steel Marle; the great Advantages of all which are very obvious and rational.

Mr. *Evelyn*, in his *Philosophical Discourse of Earth*, says, *Marle* is commonly met with and taken out of Pits at several Depths, and is of divers Colours, *Red, White, Grey, Blue*; all unctuous, of a slippery Nature: The best is most pure and unmixed, for it sooner relents after a Shower, and when dried slackens, and crumbles into Dust, without growing hard again.

Marle is of excellent Use to fix light Sand and dry Grounds: Some are for the White and Grey, and others the Blue and Red, according as it is more or less apt to resolve after wetting; but it is to be observed, that neither of them discover their Virtue till after the first Year. It does incomparably well on Pastures; and some, if right mixed, on Arable. But it has been disputed, whether Marle has any fertilizing Qualities of itself, because it doth not send forth the first Year: But without doubt its lying a Year above Ground, and being calcined by the Sun, makes it a fit Recipient for the Nitre of the Air, which is judged to be one great Cause of Fertility.

We are told, that at *Dunhead St. Andrews*, their White Marle for seven or eight Years bringeth great Profit, and seven Years more it will do the same with Sheepfold and Foddering, &c. but after twenty Years it hath been weakly reckoned ill for the Soil; although repeated Practice contradicts it.

It is the Practice of some to burn Marle as Lime; and so used, it is thought, it much improves the Land: For three good Crops may be had from a Marling, *viz.* Wheat, Pease, and Wheat again. It is usual to lay Three Hundred Loads on an Acre raw; but Sixty Loads when burnt will do: And it is observable, burnt Marle makes mighty sweet Feed for Cattle.

Lay Marle out in the beginning of Winter, and it closes like Clay, if the Wet take it; but Dung, and Soil, or Lime, cures it again. I take this to be a farther Argument for Nitre, and that what we lay on Land is chiefly to receive it; for you see when it is first filled with Wet, there is no room for Nitre; but when it is warmed by Dung, &c. that causes a Ferment, and it grows drier; then it is good again.

The Signs of blue Marle is, when in Ditches, Highways, &c. in fair Weather the Ground is candied like a white Frost, which is the Nitre in the Marle, and what properly speaking makes it so fruitful; and its only Quality is reckoned to be the chief Cause of its contracting so much of the Salt or Nitre of the Air: For which Reason most think, the longer it is exposed to the Air the better; which justifies the Practice of those who lay it on Grass-Ground three or four Years before they admit the Plough, and then also take care not to plough above an Inch into the natural Soil, lest it be buried or work too much downwards, as it is very apt to do; though not so much as *Lime*.

There are several Ways of discovering and distinguishing *Marles*, and their Goodness: But their being such great Varieties, to give any one general certain Rule, is hardly possible. Its oily unctuous slippery Nature, discoverable by the Touch, is a very good Indication of a right sort, especially if it be pure and unmixed, and will dissolve in Water. However, those which are not unmixed, and are of a hard Nature when first dug, are not to be rejected; because Frost, Rain and Sun-shine will dissolve them, and discover their good and fertilizing Qualities. There are few Counties in *England* destitute of it: But happy are they who have Land near it, wanting to be improved. Amongst the rest of the Riches of the Bishoprick of *Durham*, this also is found in many Places in great abundance, especially at or near the Lime-stone Quarries: And although the Husbandmen do not generally come into this Improvement, for want of a right Knowledge; yet it is hardly credible to report what Wonders it will do when rightly adjusted and proportioned. For herein indeed lieth the great Mystery and the chief Advantage, *to suit the Land and the Marle together*. Neither can there herein be given any other more certain and general Rule than this, That Contrarieties being the Principles on which the Improvements in Vegetation are founded; Marle being of a *cooling, binding and saddening* Nature, all *light, open and warm* Land is a fit Recipient for it; and so, on the contrary, most sorts of Clay being in their own Nature *cold and binding*, will be rather prejudiced by it: Though even in this Consideration the Nature both of the Clays and the Marles ought to be well understood before their Mixture be rejected. Therefore, upon the whole, instead of giving more general Rules, which would admit of great Exceptions, I would advise Trials and Experiments in small Quantities. Try a Load or two upon each particular sort of Soil you have, and in different Proportions; and according to the Success from your Judgment and your Practice: And by this means you will soon discover better and surer Rules, by which to know the Riches and Profit of *Marle*, than can be afforded by any Reasoning or Philosophical Dissertation.

I have already observed, that light, sandy and gravelly Soils are fittest for the heavy Nature of *Marle*; but yet, I believe, the greatest Difficulty relating to Clays would be removed, if the Land lay perfectly dry. However, all mixed Soils, be they never so poor and not apt to be floated, will receive unquestionable Benefit. It may be laid on, either before or after Winter; and as to the Proportion or Quantity, it is better to err in laying *too little* than *too much*. The common Practice is from two Hundred to four Hundred Load to an Acre: But as its Nature is something like that of *Lime*, to work *downwards*; if the Field lie on a slope, the best way is to lay the greatest Part on the greatest Elevation. From hence, however, it will be easily gathered, that the most desirable Situation for *Marle*, is a Flat, or something near it. When such Land is *marled* with Discretion, or with a Judgment formed from Experience, you may behold it as vastly improved for at least Thirty Years. Only it is to be noted, that if you keep it in Tillage and Pasture interchangeably, (which is indeed most adviseable) you must give it a sprinkling of Dung for every Crop of Wheat; and this will keep the Land in a perfect State of Health, and help to loosen the binding Quality of the *Marle*.

BLOOD, its Use in Improvement of Land, &c.

BLOOD is useful to many Purposes. At the *Wyches* in *Cheshire*, the Salt is purified with Blood; I presume, for the same Reason, we purify other Matters with Whites of Eggs. But what is to our present Purpose, is, that Blood is an excellent Dung, having in itself all the Principles of Fertility, because 'tis alkalous, as we see by Spirit of Blood; and imbibes the Nitre, as indeed all Animal Substances will. Mr. *Evelyn*, in his *Philosophical Discourse of Earth*, says, Blood is an excellent Mixture almost with any Soil, even where Fruits are planted, especially Mural; and of great Advantage to the Grape, poured about the Roots diluted. He tells us, that after the Battle of *Badnum* in *Devonshire*, the Blood of the Slain did so fertilize the Fields, where Corn had been sown a little before, that the Year following produced so extraordinary a Crop, as most of the Wheat-Stalks bare from two to fourteen Ears. The Owner, by Reason of its treading, thought to have re-sown the Land, but was dissuaded from it, and it happened as above. Mr. *Evelyn* also says, that Lime tempered with Blood extraordinarily improves its fertilizing Quality; and this is caus'd, I presume by its spiritous Nature.

It is generally thought that the old Walls, so remarkable for their impenetrable Hardness, have had their Mortar fix'd up with Both; the Glue of which has so well held it together, as it hath grown into a Stone. Some, when they have salted Beef, and barrel'd it up, will rub the Joinings at each End with Blood; and when it is dry, it will serve as Rosin to keep the Vessel tight and free from Air.

Blood makes very good Medicines; and from it may be drawn Spirits, Oil, &c. like those of Hartshorn: And it is not doubted but it will make good Oil of Asper, to catch Fish with.

Since then the Blood of all sorts of Animals in its Nature, and for outward Applications, is so useful to Mankind; what pity is it (say many learned and good Divines) that any Portion of it should be wasted in heightening an unnatural Savour to Meats and Sauces, whilst they see a Prohibition appearing with, and carrying such a Face of Authority, as * Scripture, Councils, Canons, Fathers, Imperial Constitutions, and universal Practice, unless in these Western Parts of the World.

Modesty, and a becoming Deference to the Opinion and Practice of good and great Men, more learned and wiser than my self, readily restrain me from interposing or calling in question the Judgment of Those, who justify their Practice, and the Indulgence, from those general Words of our Saviour, (*Matth. xv. 11.*) I shall therefore only call in the modest Observations of my learned and often cited Author, Mr. *Evelyn*, who expresses himself † “ In wonder how it happened, that so strict, so solemn, and famous a Sanction, “ not upon a *ceremonial* Account, but (as some affirm) a *moral*, and perpetual from *Noah*, “ to whom the Concession of eating Flesh was granted, and that of Blood forbidden, “ should not to this Day be once revoked; and whilst there also seem to lie fairer Proofs “ than for most other Controversies agitated among Christians, should be so generally “ forgotten, and give Place to so many other impertinent Disputes and Cavils about superstitious Popperies, which frequently end in Blood and cutting of Throats. As “ to the Reason of this Prohibition, (its favouring of Cruelty excepted; and that by “ *Galen*, and other experienced Physicians, the eating of Blood is condemned as unwholesome, causing Indigestions and Obstructions;) if a positive Command of Almighty God “ were not enough, it seems sufficiently intimated, because Blood was the Vehicle of the “ Life and Animal Soul of the Creature; for what other mysterious Cause, as happily “ its being always dedicated to expiatory Sacrifices, &c. it is not for Us to enquire. It “ is said, that *Justin Martyr* being asked, why the Christians of his Time were permitted “ the Eating of Flesh and not the Blood, readily answered; *That God might distinguish “ them from Beasts, which eat them both together.* It is likewise urged, that by the Apostolical Synod, (when the rest of the *Jewish* Ceremonies and Types were abolished) this “ Prohibition was mentioned as a Thing § necessary, and ranked with Idolatry, which “ was not to be local or temporary, but universally enjoined to converted Strangers and “ Profelytes, as well as *Jews*: Nor could the Scandal of neglecting to observe it concern “ them alone, after so many Ages as it was and still is in continual Use, and those who “ transgressed so severely punished, as by an Imperial Law to be scourged to Blood and

* Gen. ix. 4. Lev. iii. 17. Lev. vii. 26, 27. Lev. xix. 26. Lev. xvii. 10. Deut. xii. 16, 23. Deut. xv. 23. 1 Sam. xiv. 32, 33. Ezek. xxxiii. 25. Acts xv. 20, 29. Acts xxi. 25.

† *Acetaria*, Page 157. § Acts xv. 20, 29.

“ Bone. Indeed, so terrible was the Interdiction, that Idolatry excepted (which was also
 “ moral and perpetual) nothing in Scripture seems to be more express. But this by the
 “ way.

URINE, for Improvement of Land, &c.

FOR Improvement of Land, Mr. *John Woolridge*, in his *Systema Agriculturae*, tells us, that the *Dutch* carefully preserve their *Urine* to enrich their Ground. *Columella* says, old *Urine* is excellent for the Roots of Trees; that a Woman near *Canterbury* saved her Cows *Urine* to sprinkle on her Meadow, which at first made the Grass look yellow, but afterwards it grew wonderfully; and that Man's *Urine* is of great Use for the same purpose.

And without doubt, notwithstanding what some Writers say to the contrary, it is of very great Service. The Observation of its poisonous Nature, and its mortifying Trees and Plants where it falls, is what has brought it into disrepute with some. But that is only the indiscreet use of it, by the Application of too great a Quantity, that makes it noxious; for even Dung itself will have the same Effect for a time, where it is laid too thick. Therefore to make it answer the Ends of Vegetation, it should always be discreetly mixed with Earth or Dung, before it is applied: For as it is alkalous, like Lime and Dung, it imbibes the aerial Nitre; and the staler it is, it is more impregnated, and of greater Use, as it is with rotten Dung. And this may be conceived, if we consider how Salts will encrease with the Air: for Salt and Tartar, if not kept very dry, will melt; and the ingenious Dr. *Gould* has proved, that Oil of Vitriol, if left open to the free Air, will encrease in Quantity.

Dr. *Plot*, in his *Natural History of Staffordshire*, and Mr. *Evelyn*, in his *Philosophical Discourse of Earth*, in divers Places, commend *Urine*; and, I think, for Improvement of Land (if rightly managed) it hardly has its Equal. The Salt of *Urine* is of the same Nature with Pot-Ash. They use a great deal of *Urine* in the making of Allom; the best is that which comes from poor labouring People, who drink little strong Drink: And it is observed, that those yield most Salt, who wash their Bodies with Drink least.

Urine seems much to agree with Tartarous Lees: Not only because *Urine* is a Lee made of Vegetables in the Bodies of Animals; nor because in the Receptacles of Urines, Tartarous Stones are bred, like as in Vessels of Wine; nor because *Urine* dischargeth and abateth Colours, as Lees of Tartar, or the dissolved Salts of Tartar, do; but because Tartar and Sulphur Lees do colour the Superficies of Silver, as Urines. And the Difference I make between *Urine* and Tartarous Lees, is only this, that the Salts of both seem by their Effects in Dying in a manner the same; yet *Urine* is made and consists of Salt and Sulphur both.

The stale *Urine*, or old Mud of Pissing-Places, will colour a well scoured Piece of Silver into a golden Colour: And *Urine* fermented and distilled at the Flame of a Lamp, (by which are produced a Volatile urinous Salt and a Water,) has strange Effects: The Fluid is such, that if the Hands and Face are rubbed with it, and then the Party goes into a dark Place, he will look as if he was on Fire; and the Solid, though you can take it in your Hand, yet if you hold it long, it will burn you; wherefore it is kept in Water: But rub a Piece of this on Paper, it will set it on Fire; and if you write with it on Paper, nothing is seen; but carry it into a dark Room, and then you may plainly read it, and the Letters look as if they were Flame, but the Paper will not be burnt. This was very surprising till it was commonly known.

Where so great Improvements are expected and found from the Folding of Sheep on Ridges of Land for Wheat and Barley; those who have made nice Observations, attribute more of the Riches to the Salts of the *Urine* of the Sheep, than of their *Dung*; and accordingly contrive, if possible, that their Sheep shall have access to Water; for though they will live and thrive too *without* Water, yet it is rightly judged that the Improvement of the Land by *Urine* is much greater *with* it.

From *Urine* are drawn divers Medicines, and most seem to be of the Nature of Spirit of Hartshorn. It is of itself a good Medicine, both outward and inward; for it is often used with Success for the Itch, and other cutaneous Distempers: It is reported, it will disperse Tumours, and cure Gangreens and sore Eyes, by reason of its volatile Salt; and for the same reason it helps Tertians, Dropsies, Jaundice, Stone, Gripings, and most Diseases of Pain.

Urine is used among the Dyers; and in blue Vats it is made use of instead of Lime.

DIGGING, its Improvement in Husbandry.

SOME are of Opinion, that Digging of Land is preferable to the Plough; for by that means it is all deep enough, and you may have a great deal of fresh Mould, and can without Clods have it as fine and smooth as you will; neither is the Expence of it so great as some Persons may think, it being done about *London* (as I am told) for Twopence the Rod, or four Nobles the Acre; but I do not suppose it to be new Ground.

If it be thus; what is the extraordinary Charge of Digging, &c. may well-nigh be saved in the Seed; and it may be managed so as better to be preserved from Birds or Vermin, and then you have the Goodness of the Soil into the Bargain. I have seen a great deal of Digging for Beans and Roots in Common-Fields, on both sides of *Ebbisham* in *Surrey*, and other Places in *Berkshire*; but yet I find the Gardeners near *London* love the Plough, and when their Land is well ploughed, they employ Men to hoe little cross Furrows to lay Beans, or trill Pease in, and so with the Hoe again cover them. And why may not it be thus with Wheat?

The Hoe at all times will clear the Weeds, and supply the Grain with good Earth. If Land be shallow, I presume it may be worth while to lay one Part of the Land upon the other, and there set; which, in small Quantities, is easily tried.

Mr. *Worlidge* gives an Account, how that deep Ploughing may be as good as Digging; and quotes Mr. *Plat*, by that Management, to have a great increas of Corn. And Mr. *Houghton* advises the Country Farmers, to send their Sons they design to breed in their own Way, to live a Year or two with the Husbandmen about *London*, that are partly Gardeners and partly Ploughmen, or at least to take some Servants that have been thus bred.

By this means they will be more acquainted with the Advantages both of Digging and Soiling their Lands.

The true Reason, I take it, why digging for Improvement of Land is not more practised about *London*, where no Diligence and Industry is wanting, is, because there is no want of Dung; which, by frequent Repetitions, effectually cures Sterility, and makes the most barren Soil to produce Wonders: Inasmuch that you shall seldom see any Land (especially near the Navigation) within five Miles of *London*, so lye fallow. They only Plough, and Dung, and Sow, and every Year change their Crop; from *Wheat* to *Barley*, from *Barley* to *Pease* and *Beans*, and so *Wheat* again; still keeping the Dung-Cart going, because they have enough. But when once you are removed from the near and immediate Influence of such Treasures, I cannot but think (if the Soil be any whit deep and good, a Spade and half, for instance, or two Spade deep) it is an excellent piece of good Husbandry to get near as deep again as the Plough with the Spade, and so dig or trench the whole Field over; thereby throwing down that which is worn out to the Bottom, and raising up a new and fresh Soil, which may last four or five Crops together, without any other Advantage but continual stirring. This is no barren Theory or Notion; but the Use and Advantage thereof is supported by Practice and Experience; and it has been found, that the Charge, as above, is sufficiently repaid and even doubled by the saving of Manure, and Ploughing, and a third part of the Seed.

But where the Soil is shallow, and nothing but either a barren Clay, Gravel, Sand or Rocky Substance below where the Plough goes; there indeed it is very ill Husbandry to go deeper, either with the Plough or Spade, to fetch up a hungry Soil worse than the Surface. Reason and Foresight therefore must always govern. But where the Soil is good eighteen or twenty Inches deep, there it is the Husbandman's Interest, and it should be his Care, once in Twenty Years to dig his Tillage for all sort of Grain; and I need not say how much stronger the Reason is, if he intends to sow *Carrots* or *Parsnips* for his own Use, or the fattening of his Hogs.

Concerning

Concerning the several Sorts of CORN or GRAIN generally sown in England, viz. Wheat, Barley, Rye, Beans and Pease, &c. with the proper Methods for their Cultivation and Increase.

Of W H E A T.

I Begin with *Wheat*, as the King of Grains, and the Pride of the Farmers Harvest, there being not any Grain in *Europe* more universally useful and necessary than *Wheat*; which is never more sensibly felt and understood, than when there proves a general Failure in the Crop.

There are observed in *England* to be seven or eight sorts of Wheat. (1.) The Egg-shell Wheat, reckoned best for light Lands, and to be mixed with Rye for Maßen; it being early ripe. (2.) The Double-eared Wheat, much sown in *Essex*, and prospers in a heavy Clay or a loamy Soil. (3.) The Red, or *Kentish* Wheat, much sown in *Hertfordshire*, and is sometimes found with Awns or Beards. (4.) The Great-bearded Wheat, which thrives well on a heavy Clay. (5.) The Pollard Wheat. (6.) The Grey Wheat. (7.) The Flaxen, or *Lammas* Wheat. There are also many other Names given to some other sorts; as the Ograve, the Chiltern, the Turkey, the Saracins: But it is uncertain, whether there be any other real Difference between many of the sorts, but what the different Nature of the Soil and Climate affords. But however, this is certain, that all of them are good and useful, affording to Mankind great Relief and Support, well answering the general Character of being the Staff of Life.

Wheat grows in almost all Countries of the World, and loves a Soil that is rather dry than too moist; and yet rather stiff than too light; where it flourishes greatly if well and seasonably cultivated. Neither a very rich, nor yet a very poor Soil, is best for Wheat in general; for the *last* yields but poor Corn, and the *first* will run all to Straw; as hath been sufficiently experienced in the *West-Indies*, where some Straws have grown to the Heighth of a Spear or Pike: Wherefore the Husbandmen, both ancient and modern, are wont to eat down their too rank Corn in the Spring with Cattle, when young, before it ears.

A mixture of Clay and black Mould, commonly called Hazel-Mould or Brick-Earth, is the best and most agreeable. But yet the red *Lammas* or Bearded Wheat, will do singularly well on the most strong stiff Clay, or coldest Land; only the colder it is, it is so much the longer a ripening; which in cold wet Summers, and a far *Northern* or elevated Situation, is a Circumstance that ought to be considered. All the sorts of Wheat are commonly sowed after a Summer's Fallow, when the Land has been ploughed and turned up to the Sun and Weather four times; though for Pease, Beans, and Oats, it is seldom ploughed more than once: The Reason whereof is, because the Ground was so well prepared the Year before for Wheat, and the Nitre is not yet spent. But without doubt, if the Wheat-Stubble be ploughed in to rot or burnt, and after some time ploughed, the Husbandman would not lose his Labour; for the Ashes of the Straw will suck in the Nitre, and so will the Straw when rotted. And this I take to be the chief Use of all Dungs; which as they are more or less *receptive*, so they are better or worse for Land.

Wheat is commonly sown in Autumn, and better in a wet Season than a very dry one; and it may be either earlier or later, as the Nature of the Land and the Situation of the Place require. It is sown in various sorts of Lands, and in different Methods; sometimes in Inclosures, and more often in Open and Champion Fields: Only it hath by some been observed, that what is sown in Inclosures or Lands sheltered, is more subject to Mildew; which is attributed to the want of a free and open Air. But I am apt to think, there is not much Weight to be laid upon the Observation.

The Method of preparing Wheat for Sowing, I have already laid down. I am here only to take notice, that two Bushels is the common *Quantum* for an Acre; though where the Land is very rich, *less* will do; and if it is very poor, something *more* must be added. There is also some Consideration to be had to the Nature of the Seed; which if it is small will run further, but the larger Sorts fill the Hand with less in Number, and consequently will not spread so far; which is the reason, that if the Land is not too strong and heavy, the smallest Seed is chosen. The Seeds-man here is to be put in mind, that he take great Care to sow the Seed, not in Heaps and Patches, but in an even regular Manner; letting the Seed slip through his Fingers, and his right Hand to keep exact Pace with his left Foot.

Sometimes the Wheat is sown immediately after Ploughing, and so harrowed in. But this Method hath been found not so well to secure the Corn in hard Winters, or to defend it from excessive Droughts in Summer, having not a sufficient Depth of Earth. And therefore the Rule now most generally prevails; to sow it before Ploughing, or as it is called *Under-Furrow*: Not suffering the Harrow to come upon the Land, but leaving it rough and full of Clots not over-big, to secure the Wheat the better from excessive cold Winds and Frost; still remembering to keep open the Trenches to let out all stagnating Water, and to shovel up the Lands-Ends clean, where the Clots or Earth have been drawn over them by the Plough.

Sometimes Wheat has been sown in the Spring with great Success, where the Soil is warm, and when the Summers have proved favourable. And tho' it is commonly said and thought, that Wheat sown at that Time runs all to Straw; yet *that* is in a great measure a Mistake, and only happens in very wet Summers, when the Ears do not fill, nor the Corn well ripen. I remember a Friend of mine in *Berkshire* told me, That after the great Frost in 1708 had killed all or most of his Wheat sown in Autumn, he ploughed it up, and sowed it again in *March*; which succeeded so well, and produced so great an Increase, that the Crop of Wheat, which sold the following Winter for Ten Shillings and Twelve Shillings a Bushel, would have purchased the Fee-Simple of the Land.

Setting of Wheat, either with Sticks or other Instruments contrived for more Expedition, hath always a *saving* Advantage attending it; for little more than a Gallon will serve for a whole Acre. And in a dear Year, when Wheat is Ten Shillings a Bushel, it may be easily computed that the Farmer saves Seventeen Shillings and Six-pence in his Seed-Wheat for every Acre, which will doubly pay for the *setting* it; even in the ordinary Way, by Boys and Girls at Three-pence a Day. In Mr. *Everard's* Computation, each Grain should be sown at ten Inches distance; because, if the Land is in Heart, it will spread and tiller into many Stalks.

Mr. *Houghton* tells us of one Grain of Wheat that had eighty Ears, which contained above 4000 Grains; and computes that an Acre of Ground, enriched with the nicest Husbandry, may produce 26 Quarters of Wheat. But he doth not suppose that all Grounds will produce alike, neither had he Faith enough to expect to see so great and good Husbandry in any great Quantity. But he seemed satisfied that any Land may be greatly improved; and that if such Things can be done in a little, the like, with the same Land and the same Management, may by Parity of Reason be done at large.

It hath been reckoned very good Husbandry in some Places, to take a dry Season in *March* to run over the Wheat-Land with a light Harrow and one Horse, a little to break the Clots, and to nourish the Roots of the Corn with fresh Mould, and to cover what the Winds and Winter-Frost may have left something bare; by which means the Corn is observed to gather and spread the better, and will also be left in a Condition the better to admit the Scythe at the Season of mowing the Stubble; which is the Practice of most Countries; *that* being reckoned better for Covering than Straw, both for their Ricks of Corn and their Houses.

The Time of weeding Wheat is *May*, or the Beginning of *June*, before it is eared; and though it happen to be never so full of Thistles, &c. yet you should carefully weed them out with a Hook at any Charge; for *without* that Charge and Pains little can be expected, and *with* it you will be doubly repayed. There is as much Reason to be careful in not beginning to weed too soon, as in staying too long: For an early Weeding oft-times requires a second; and a late one, without great Care, doth much harm, by means of treading and bruising the Stalks.

Towards *August*, the Wheat ripening and changing Colour, it should be carefully secured from Crows and Sparrows, the great Enemies and Devourers of it, especially near Hedges. Before it is quite or perfectly ripe and hard, so as to shake out of the Ear, it should be reaped; that Method being observed to make it of a finer Skin, and consequently

ly more marketable: And it will quickly harden in the Sheaf and Stouk; which should generally be suffered to stand abroad Ten Days or a Fortnight. In which time, if moderate Rain should come, it will only plump it, and two or three Days of dry Weather will mend it again. In many Places I have seen it practised with very good Reason and Advantage, *viz.* to make one or two Sheaves larger and longer than ordinary, which are dexterously applied to the Top of the Stouk, opening them in the middle, and letting the Ears hang downwards; by which means a great deal of Rain (if it should happen) will be shot off, and the whole be kept dry.

After this, it is either carried into the Barn, and there laid with the Ears inward, or (which is much the better, the more improved, and modern Practice) it is laid on Stacks or large round Cocks out of Doors, to be defended with Thatch on the Top. This last Method, though variously practised in different Countries, yet is now by all universally agreed to be the best, both for keeping the Corn dry, and preserving it from Vermin. The want of which Knowledge put our Forefathers upon erecting those vast and costly Barns, now supported and repaired at great Charge, and are in many Places left as stately and empty Spectacles of the Indolence or Ignorance of former Ages.

However, the Custom of Housing the Corn in some Places still remains. For in *Norfolk*, and the Counties adjacent, they take this following Method. After the Barn is well aired, and the Floor covered with clean Wheat-Straw or Bavins, in the middle of every Bay is placed an empty Hogshead; and the But-ends of the Sheaves of Corn, whether Wheat or Barley, are laid round it; and if Oats, unsheafed Barley or Pease, they are trod close to it, until the Corn reaches the Brim; and then the Hogshead is pulled up higher; and so on till the Barn is full, that just the Hogshead may be got out, which leaves a *Well* behind it to the very Bottom, called a *Well-Mow*: Into which the Moisture and Sweat of the Corn gathers so much, that whilst it is heating, no one can endure his Head over the Hole; and if a Mouse fall into it, it will suffocate it. This Method (they say) preserves the Corn tolerably well, especially if they observe, after the Moisture is gone, to make the Barn as close as possible.

Where there are Barns already built and well repaired, this Practice may not be unadvisable. But without question, where Choice may prevail, (one or two Bays at most being sufficient for Thrashing) setting the Corn abroad in a well-fenced Place, is much better than housing it. Especially if the still more improved Practice were admitted, *viz.* to make a strong framed Hovel set upon either Stone-Posts with Caps, or wooden Posts, lined about in the middle seven or eight Inches deep: For this not only effectually prevents Mice from coming at the Grain, but secures also the Bottom from being affected with the Damps of the Earth.

Wheat, the drier it is, the more it weighs: And a Bushel of dry Wheat (if it be good and sound) should weigh from 60 to 64 Pounds. If it be any way damaged, mixt or corrupted, it will not weigh above 54 or 56 Pounds. So that the Goodness or Badness of Wheat may in great measure be discovered by its Weight, and consequently its Value also. For tho' the Lightness of a Bushel of Wheat may be owing to its being mixt with Oats, or other Seed lighter than itself, and yet be good and dry; yet that Mixture so much diminishes the Quantity of good Wheat, and consequently its Value.

Of BARLEY.

BARLEY is a most necessary and useful Grain, tho' too often made to minister to the worst Purpose of *Intemperance*. For such is the Profuseness, such the Ingratitude of the corrupt Part of Mankind, that what God gives as a Blessing to be used with Moderation, they too often prodigally waste in Excess, to the Abuse of Reason, and to the Violation of the Laws of God and Man.

There is not a great deal of Difference observed in this Grain. The most remarkable Sorts are four. 1. The *Long-eared*; most generally esteemed for all Uses, and all sorts of Land. 2. The *Sprat* or *Fullum* Barley; which, for rank Land is best, because it doth not run to Straw, as the common sort, and is thought to yield something better, tho' the Maltsters do not like it so well. There is a *Hot-spr* or *Rath-ripe* Barley, usually harvested a Fortnight or Three Weeks before the other, and delights best in some Sorts of hot and light Land. This sort of Barley hath been sometimes sown and returned to the Barn in two Months Time, very often in nine or ten Weeks. It is much sown in *Oxfordshire*; but it is no Native of that Country, but fetch'd from *Patney* and other Parts of *Wiltshire*; where the Soil is of so peculiar a Quality, that whatever other Barley is sown there, yet

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(as the Countrymen observe) it most commonly Turns into This. In the *Western* Parts of *Cornwall* they sow this Sort of Barley near the Sea, which they carry to the Mill in eight or nine Weeks after it is sown. However, what comes to *Oxfordshire*, comes all from *Patney*; but it is not so agreeable to the *Oxfordshire* Soil, coming immediately from thence, as when it hath been sown elsewhere twice or thrice: After which, it endures not above three or four Years, but degenerates again into common Barley.

Its Conveniency is very considerable in wet and backward Springs, succeeded by cold Summers, when many other Countries lose their Seasons, and some of the more *Northern* Ones perhaps their Crops, the common Barley never coming to be perfectly ripe. Whereas this may be sown at the latter End of *May*, and will come to be ripe in the worst of Summers; so that it is generally approved of by all sorts of Husbandmen.

Only this Caution is always to go along with the Practice of sowing it; that the Husbandman be not too hasty in sowing it in the *Spring*: Because as it ripens a Fortnight sooner than the other Sorts sown at the same Time, it will tempt the Sparrows and other Birds to lie wholly upon it, to the Hazard of being utterly devoured. I once observed two or three Ridges of this Barley sown in a common Field, by Way of Trial, in *March*, with the other Sorts; and tho' the Crop proved excellent, the Whole was entirely destroy'd the Birds being very eager (after great Hunger) of catching at the first ripe Corn.

4. There is a fourth Sort, much different from the foregoing: In the *Northern* Parts it is called *Big*, or *Scotch* Barley, having a square Ear and four Rows of Corn, as the other Sorts have but two. The Practice of sowing *Big* hath for many Years almost universally obtain'd in the Bishoprick of *Durham*, *Northumberland*, and the more *Northern* Parts, for want of better Knowledge. For, to say nothing of the general Dislike and Dislike which Strangers take to it made into Drink, on the Account of its purging raking Quality, even the same that Rye hath made into Bread; I cannot find that *Big* answers better to the Bushel than a Crop of Barley. If it have more Grains in Number, yet that Advantage is more than counter-balanced by the Leanness of the Corn, and the Thickness of its Skin; so that the Malt made of it cannot be expected to give the same Strength to Drink, as the same Quantity of Barley made into Malt will.

There are two Advantages attending this Grain, which tempt Farmers to sow, and others to buy and use it; which are these: That it is apt to ripen well and early; and hath also the same Quality when brew'd into Drink, that it is soonest ready for Use: But if what hath been above said be but well consider'd, it will quickly grow into Disuse. And indeed, its Reputation of late is very much sunk; especially since upon Experience and good Management it is found, that the common Barley ripens very well most Summers, and yields as great an Increase. And yet, if there were any danger from wet and cold Summers, the Rath-ripe Barley better answers that Objection, and is more acceptable to the Maltster.

Barley is generally, and for the most part, sown after a Summer's Fallowing, expecting the same Dressing of Land that Wheat doth: But being a tenderer Grain, and more impatient of severe Cold and Frost, the Seed-time for Barley is in the Spring, earlier or later according to the Nature of the Seed and Soil, and the Temper of the Season, allowing four Bushels to the Acre. Late sowing is accounted best for a light Soil, which is apt to run to Weeds. But the general Rule for sowing Barley is to do it whenever the Land is dry and fit for sowing, be it never so early, when *January* is once over; for it is not a little Frost that will hurt it. I have known Barley sown the Beginning of *February*, and after it appeared above-ground, there came on three or four Days hard Frosts, such as would bear a Cart to go over it without making Impression, and yet was unhurt, and the Crop proved exceeding good.

There are many different Ways of disposing the Land for Barley: Some lay the Land up in small Ridges all the Winter, that it may lie the drier, and the better receive the Influence of the Weather. Then in *March* they split the Ridges, and if they are full of Clots, harrow them; and after that, either sow it under Furrow, or above; for both Ways have been practised with Success. But which Way soever it be done, ploughing and sowing should be done both in one Day, for the Reason already assigned; that all Seed delights to be thrown into fresh Mould. Some make this last ploughing of the Land for Seed to be athwart, or cross the small Ridges, which is thought to mix the Soil much better; and then they harrow in the Seed, leaving the Whole *flat*; which is the Method for dry Soils and late Sowing.

If Barley be sown after Wheat, (which is called an *Etch Crop*, and is practised in many Places with great Success;) as soon as the Time of sowing Wheat is over, plough up your Wheat-Stubble in as dry a Time as possible, and lay three Ridges to one, if you have Dung to lay on it; if not, plough it in small Ridges as before directed, because the Land

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will lie the drier, and the Frost will mellow it the better. Or if there happen an early Harvest and dry Weather, and that your Time will allow of it, it will be still a greater Improvement, if you plough the Land before you sow the Wheat, just as Harvest is in. This will make it half as good as a Summer-Fallow. But all Years will not favour the doing it this Way.

Great Care must be taken to *weed* Barley; no Grain suffering so much as that by Thistles, Docks, &c. The Time of doing it is in *June*; and if then it appears to be a thin Crop, either thro' too much Wet, want of Seed, or any other Accident, it is very adviseable to strew Pidgeons Dung or Malt-Dust over it, by which Means it will strangely increase and gather; but this Work is most properly done in rainy Weather.

The Husbandmen commonly account their Barley ripe, as they do their Wheat, when it hangs its Head, and the Straw hath lost its Verdure. If it remain full of Weeds till it is *mow'd*, (as the *South* Country Fashion is) it must lie on the Swarth till the Weeds are well wither'd and dry'd; otherwise it will be apt to be musty, and lose its Use for Malt. But indeed the lazy and slovenly Custom of the *South* in mowing down their Barley with a Scythe, is by no means to be imitated or encourag'd, having many Inconveniencies attending it; as it subjects the Corn to great Waste in gathering it together, as well as great Trouble in loading and unloading it, especially in windy Weather. Herein therefore the neat and frugal Method of the Farmers in the *North*, is highly to be commended, never suffering the Scythe to be used amongst any sorts of White Corn; but constantly *reap* all, as they do their Wheat, setting it up in Shocks till it is dry and fit to carry; which is then done, as every one may know, with great Ease and Expedition. The Women and Children are bred up to this Work, and six of them will reap an Acre of Barley or Oats in a Day; and the Charge of this is more than over-balanc'd by what is saved, and the Expedition in carrying it.

Dr. Plot, in his *History of Staffordshire*, tells us of a *Naked Barley* or Wheat-Barley, which, tho' its Ear is shaped like other Grain, of this Kind, is yet like Wheat, without any Husk. At *Rowley* it is called *French Barley*, being like what is sold under that Name: It is a Plant between Wheat and Barley in Goodness as well as Form; accordingly it is sown to be used for Bread instead of Wheat in a Time of Scarcity: However, it also runs to Malt as well as other Barley, and makes a good sort of Drink; and likewise increases in some Soils twenty Fold.

It need not be said how very useful a Plant Barley is become here in *England* both to King and Subject; for of it is made *Malt*, which pays one of the most considerable Duties to the Crown, besides the Excise on Beer, Ale, &c. all which together make a vast Branch of the Royal Revenue.

As to the physical Uses of both Wheat and Barley, it may be observed, that from Wheat itself Medicines are made against Tetters: For being laid on an Anvil, and upon it a hot Plate of Brass or Iron, a Liquor will run from it, which you are to lay hot on the Tetter. It also makes smooth any Roughness of the Skin, is good against Ulcers of the Bosom; and the Bran pressed from the Water, apply'd hot, and often repeated, eases the Pains of the Pleurisy.

And as to Barley, the Meal of it made into a Pultis with Camomile Flowers and red Rose Leaves, applied warm to any pained Limb, gives Relief. Barley is a great Cooler, and *Water* made of it is often drank; prepared any way it never heats the Body, and it is good in many physical Cases.

Of R Y E.

R Y E is a Grain generally known, and delights in a dry warm Land, though it be not over-rich; though indeed it will grow in most Sorts of Land, provided it be loose and well tempered, for it doth not require either the Richness or Labour that Wheat doth; though it ought to be sown in Autumn after a Summer's Fallow, about the latter End of *August*, or the Beginning of *September*; still watching for a dry Time, for Rain soon drowns it. It is of very quick Growth; soon up after it is sown, sooner in the Ear, and sooner ripe than any other Grain; which Property often tempts the Farmer, in such hard Winters as prove fatal to Wheat, to sow it in the Spring, which many times turns to very good Account.

Two Bushels of Seed are commonly allowed to an Acre. If the natural Soil be a barren Sand or Gravel, (which yet with good Husbandry and every other Year's Fallowing will do) it is best to sow it alone; but if it have any degree of Mixture with heavier Land,

Land, it is best to mix Wheat and Rye together; only the Wheat ought to be sown under Furrow, and the Rye above, and so harrowed in. It flowers long; and five Weeks after the Flowers are gone it will be ripe. The Ears, when it flowers, will be upright; but a proper Shower carries away the Redness; and so being pregnant with Seed, it then hangs down its Head. When the Straw is turned yellow, and the Corn becomes hard, it is full ripe. And though it is not apt to shed, yet if it is weedy, it ought to lye on the Gravel after it is cut, some time before it is bound up into Sheaves; otherwise it will be apt to *give* in the Barn, which will cause it not to thrash well and to be musty.

However, as it is a Grain that will grow in the Ear the soonest of any, it must be carefully watched and defended (as above in the Chapter of *Wheat*) from too much Wet; and you ought to take the first Opportunity (after it is dry) to carry it home, and put it out of danger.

There is a Practice much to be commended and encouraged; for in some Places they split the Ridges of the Wheat-Stubble, and sow it with Rye, in order to gain Food for Sheep, in a Time when they most want it, *viz.* in *March* and *April*, allowing a Bushel to an Acre; which they harrow in, and feed when proper till *May*, whereby the Land will be well folded and dunged, so as to be fit for a Summer's Fallow. But these Methods cannot be practised in common Fields.

Rye is esteemed by many the best Bread-Corn next *Wheat*; only the Bread made of it is black and heavy; and the Sweetness that attends it pleases some, and displeases others: But its best Quality is, that mixt with *Wheat* in the hot and dry Weather, it keeps the Bread *moist*. But those who are not used to it, complain they are frequently griped and purged by it.

In plentiful Years, instead of Pease and Beans, it is given to Hogs with great Profit; for after it is ground, and made into a stiff Paste, the Hog will eagerly feed upon it, and will be fat in a short Time, not cloying him with too much at once, and never letting him want Water. Only it is always to be remembered, that one or two Bushels of Beans or Pease should be given him at last to harden his Fat.

It is thought an excellent way, to keep this Corn good and sweet, to let it lye on a dry Floor with the Chaff after it is thrashed; for that Moisture, which would otherwise go into the Corn, is imbibed into the drier Chaff; which, in a proper Season, soon becomes dry again, or the Grain may be separated from it as occasion serves, and so becomes always fit for the Mill.

The Price of this Grain usually keeps equal pace at Market with that of Barley; and Wheat is most commonly double its Value. In many of the Inland Countries, it is carried mixt with Wheat, as it grows, to the Market; and according to the proportion of Wheat, it is of more or less Value. And this is commonly called *Maslen*.

Of O A T S.

O A T S, of which there are divers Sorts, (as the *White*, the *Black*, the *Poland*) grow in all Countries, as well hot as cold, and are of as general Use and Esteem. They are sown with us in *England* in *February* and *March*; commonly upon an Etch Crop. Some think, that the Black Oat being much more hardy than the White, will well survive the Winter, if not over severe, and by that means yield a vast Increase. But I cannot find, that the Husbandman is often willing to run the Hazard. *Black Oats* delight most in Morass and Fenny Ground; as also rather on cold moist Land than on dry; and may be sown sooner in the Spring than the White, because they are hardier and will bear Wet better.

However, the *White Oat*, being better for most Uses, and more suitable to the generality of Soils, is most sown and sought for; especially the large White *Poland Oat*; so called, for that it was first brought from *Poland*, and is still continued to be brought from thence occasionally: Forasmuch as it is very apt to degenerate and grow lank, after four or five times sowing. The Corn is very large, and plump almost as Barley, and is therefore much coveted to make Oatmeal, so very useful to the many Purposes of Life. This Oat yields great Increase on good Land new broken up; and I have known Ten Quarters Product from four Bushels sown on an Acre. There is some difficulty with them in a wet Harvest, being very apt to *shed* after much Rain, when they are full ripe. But yet it is a precious Grain, and very much sought after of late Years. Besides this,

The smaller Sort of White Oat is very profitable, and will grow very plentifully on such Lands, where, by reason of the Cold, no other Grain will thrive. In short, there is no Ground too rich nor too poor, too hot nor too cold, for them: And beside, they speed better than other Grain in Harvest, the Straw and Husk being of so dry a Nature, that though they are housed wet, provided they be free from Weeds, they will not heat in the Mow, nor become mouldy, as other Grain usually doth.

All sorts of Oats, though (as hath been said) they will grow almost any where, yet give the best Increase from new broken up Ground for three or four Years, according to the Strength of the Land. For want of this Knowledge, I observe many Places in the Bishoprick of *Durham*, where they plough up the green Sward which they intend for Oats, and so continue a whole Summer's Fallowing; losing the Advantage of the Land for the first Year, under a false Notion that little or nothing will grow on the first Turf.

But this I apprehend to be chiefly owing to the want of knowing the Use of a Roll. Without the Benefit of which indeed, the Hollowness of the Soil in a dry Summer will subject the Crop to the hazard of coming to nothing: But with the Advantage of a Roll eight Foot long, and twenty Inches diameter, drawn by one Horse, soon after the Oats peep above Ground, it is commonly found the first and second Crop are the best. Accordingly I hope to see my Countrymen grow rich, by destroying the whole Train of *Furzes* or *Whins*, the Disgrace of every Farm, and improving the Land by the afore-said good Husbandry. But for the entire destruction of such Weeds and Trumpery, I refer them to a proper Place.

The Quantity of Seed to the Acre, is to be proportioned to the Strength and Goodness of the Soil. Four Bushels is sufficient where the Land is very rich and mellow, that the Seed can be all buried; otherwise if the Land is poorish, six or seven Bushels will be expected. And as soon as *February* sets in, I think the Husbandman should get to work, provided the Land be in order, and the Season favour. I need not say, if the Land is new broke up, the Ploughing should be over before *February*, that it may receive the Benefit of Frost, in order to gain Mould to cover the Seed. But be sure let him not forget the Roll when the Corn begins to look green. It cannot be repeated too often, that a Change of Seed is very necessary, though the Farmer is too often forgetful of what he knows to be right. However, this is a Grain that is also taken great Care of in the *North*, as it ought, being bound up in Sheaves, as Wheat in Harvest.

In *Staffordshire*, and so on to the most *Northern* Parts, is a sort of red or naked Oats, that are much made use of for Oatmeal, because the Kernel thrashes out of the Hull, without carrying it to the Mill or drying of it: But it is by no means so good as the White Oat duly ordered.

In *Wales*, most of the Bread the ordinary People eat is made of Oats. And when Corn has been dear, in several Places about *London*, the Poor have made their Bread with three parts Oatmeal and one part Barley. And indeed, at such a Time Oats are the chief Sustenance of the Poor throughout the Kingdom. The *Scots* use Oats in a great degree in their Wars; for with a Bag of Oatmeal and a Kettle, they'll sustain themselves a great while. And indeed, it is a fit Corn for that Country; inasmuch as Oats may be sown and mowed while the Sun is hot, whilst harder Corn requires longer Time, and a kinder Climate.

Oats are the best and wholesomest Grain for Horses, especially if kept some time; for before they have had a Sweat in the Mow, or be otherwise thoroughly dry, they are too laxative. A small pleasant Ale is wont to be made of Oats made into Malt; of which, it is said, King *William* was a great Admirer. *Water-Gruel* is also made of Oats; and *Plummary*, with beaten Oatmeal steep'd in Water, and boiled to a Jelly; and in *Northumberland*, they are strangely fond of what they call *Crowdy*, which is Oatmeal mixt with the Broth and Scum of the Pot, like Hasty-Pudding. But, *de Gustibus non est disputandum*.

Of BEANS, PEASE, &c.

There are not many Sorts of *Beans* usually sown in Fields; for 'tis only the small Horse-Bean that is commonly propagated by the Plough. They will not thrive in light dry Ground, but delight chiefly in a stiff strong moist Clay. But the best Method for their Propagation and Increase, hath not been well and thoroughly understood till of late Years. Because as they love most to grow in Clay, it has been generally thought, that if they be laid deep into the Ground, they would be buried, and never rise again; whereas Experience shews, that a Bean cannot well be buried too deep, provided the Soil be kept loose at the Top.

I remember, it was the Practice of my Parishioners at *Yelvertoft* in *Northamptonshire*, for several Years that I lived amongst them, to plough their Land in the Spring three or four Weeks sometimes, before they sowed their Beans, and after that sowed them and harrowed them in. The Effect of which was, that not one Year in five they had a tolerable Crop, and sometimes not their Seed again: Either from a Waste of the Seed by the Fowls, that pick'd up all which happened not to lie deep; or if the Seed did grow, it lay so shallow, that at *Midsummer*, when they were in Blossom, for want of Depth of Earth they withered away. So laying hold of the Scripture Expression, I ventured to argue with them on a better Authority than I otherwise durst, and attempted to persuade them (for my own Sake as well as theirs) to try a new Method, to sow the Beans *under Furrow*, ploughing them in with as thin a Calf as possible. Truly it was difficult to persuade them to believe the Parson knew that Matter better than themselves.

However, I led the Way my self, and persuaded some few others to try in small Quantities to sow and plough very early, even the latter End of *January* and the Beginning of *February*. And the Success we had that Year, soon persuaded more to follow the next; till at last, before I left them, I think there was hardly one Land of Beans harrowed in; and the whole Field one Year was sowed *under Furrow* before the End of *February*.

I have been the more particular in relating this, because I think there is a Stress to be laid upon the Justness of the Practice. And yet I should have said, that the Soil there is as rank and stiff a Clay as can possibly be met with. For after the Method became familiar and well understood, the Difficulty of letting out the Prisoners, the Seed, thro' the stiff Clay, was soon overcome, by harrowing the Surface after a Shower, as the Beans began to peep. It may now easily be perceived that this Practice not only secures all or most of the Seeds from the Fowls, but gives Depth of Earth, when they most want it, at *Midsummer*.

In short, neither Beans nor Pease should be any other way sown but *under Furrow*, let the Land be what it will; for if strong and stiff Land will be made tractable, the Argument will hold much better in a mixt Soil; and as for Pease, they are generally sown in lighter Ground, and there can be no danger of being buried. It ought however to be remarked, that there is a good deal of Care and Art to be used by the Ploughman; that he take heed not to go too deep, and to lay his Calf or Turf not edgewise, but *flat*, that the Beans may be covered close with Mould; for otherwise, if the Beans lie in a hollow Place they will grow and spend themselves with vain Endeavours to get thro', but cannot penetrate for want of some Hold and Entrance to direct their Motion.

There is no Grain that requires more Skill in the Management of its Propagation, nor turns to greater Profit to the Husbandman, than the *Bean*. Some think it rather enriches than weakens the Land, altho' it throws out great Productions; however, it doth less Harm than the white Corn, and tends to mellow and lighten the Land, and lays it up dry in Ridges fit for the next Summer-Fallow.

The common Quantity of Seed for an Acre is Three Bushels, and the usual Product is Twenty: However, if the *Berkshire* Way were but followed and practised, much less Seed would do, and a better Increase might be expected; for there they think it worth their while to Set the Beans in Rows, cross the Ridges with Sticks and Lines about half a Yard asunder, by which means they can go between the Rows with a Hough in *June* to destroy the Weeds; and at the same time to hill up the Beans with fresh Mould, which seasonably defends them from the Drought, which is their dangerous Enemy. The Charge of this is thought to be doubly repaid in the Seed which is saved, (one Bushel in this way sowing an Acre) and in the Goodness of the Crop. Sometimes they satisfy themselves to make Furrows with a Hough in strait Lines and at equal Distances, which is something more expeditious (like the Way of sowing Garden-Beans) and answers very well.

well. I tried this Method my self at *Yelvertoft*, and succeeded pretty well : But that being such very strong Land, that the very *Treading* at the time of *Setting* the Beans so harden'd the Land, that when the dry Weather came on, there soon appeared great Chasms and Cracks, which let in the Drought and did some Harm ; but in any sort of mixt Soil, I never saw any Inconvenience that Way, and the Crop very seldom failed.

There is no Grain yields a greater Increase than this, if it is rightly cultivated : But for this purpose, as a Change of Seed is in all Cases proper and adviseable, so here it is extremely necessary ; having by long Experience observed, that a Change from a lighter Soil to a stronger, and from a strong to a lighter, always has an extraordinary Effect, and the contrary Neglect is manifestly rewarded with Loss.

But to shew the prolifick Nature and Virtue of the Earth rightly cultivated and improved, and what Increase may be expected from her Bounty, the following Account and Relation from a Friend of mine in *Berkshire* may be depended upon for Truth. From one single Horse-Bean, producing only one single Stalk, Ninety Six Pods or Kids, containing in all Two Hundred Thirty Two Beans. The next Years Product from thence, carefully set and separated from all others, was Three Gallons of Beans : Which Three Gallons the next Year afforded no less than Seven Bushels and a half. From thence, the following Year there was an Increase of Seventeen Quarters and Two Bushels of clean Beans, besides what is called Offal and Waste ; all within the Compass of Four Years from one single Bean.

Some think it proper to sow *Pease* amongst the *Beans*, because the latter uphold the former : And the Method might be proper enough, were it not that poor People are greedy in stealing and gathering the Green Pease, whereby more hurt is done by their Feet than their Hands ; so that I have always found it most adviseable to sow clean Beans where the Land is any thing strong, and to reserve the Pease for the lighter Soils by themselves.

There are different ways of gathering and harvesting Beans when ripe. Some get Bottles of the Pease-Straw, from whence they make Bands and tie them up in Bundles, setting them endways one against another to dry. Others content themselves to mow them down, letting them lie to wither a Week or Ten Days, and then put them into little Cocks till they are ready for the Cart.

Pease are of several sorts, *Green*, *White* and *Grey*. But all of them require a lighter Soil than Beans : Only the common *Grey Field-Pea* will do rather best in a stiffish Soil. The common *White Pea* loves a mellow Soil, and will yield great Increase, if suffered to grow to be ripe. But however it is, the Poor and common People are very apt to think their Right takes place before the Owner, and they take Possession accordingly ; which discourages many Farmers from bestowing Charge and Labour on them.

But the *Blue-Pea* of all others yields the greatest Increase, and is useful for most Purposes both green and ripe. It is something tender and impatient of a Frost, therefore it is not adviseable to sow them till the Middle of *April*. All the several Sorts, if sowed without Beans by themselves, are commonly reaped sometimes with two Hooks, and sometimes with one tied to the End of a Stick, letting them lie in small Heaps as they are reap'd, till they find they hawn and the Cod dry. Only they should be turned and raised from the Ground as much and as oft as possible, that lying hollow the Wind may dry them, especially after Rain. The common Allowance of Seed is two Bushels to an Acre.

If the Land wants to be enriched, there is no better, cheaper and more certain Method of doing it, than by ploughing in any of the several sorts of *Pease* at *Midsummer*, just as they are in full Blossom. Their Juice and Vigour at that Time afford an uncommon Fertility to the Land, and admirably dispose it for Wheat afterwards ; which should naturally lead the Farmer to sow *Pease* upon his Fallows in Spring. But I shall have occasion to repeat this Advice presently.

Vetches or *Fetches*, by some called also *Chick-Pease*, are a very useful Grain for Horses, Hogs, or Poultry, and will grow upon almost any Soil that is not over strong and heavy. There are several sorts of them, *Red*, *Black* and *White* ; but the most remarkable Difference is found in two of the Sorts called the *Winter* and the *Summer-Vetch* : The one abiding the Extremity of the Winter, and the other not to be sown till the Spring. Both sorts are reckon'd to be great Improvers of Land, especially if used the two following Ways. (1.) Either by eating them on the Ground with Horses at *Midsummer* ; confining the Horses by short Ropes to small Quantities at a time, that they may not be surfeited with too much of this hot and strong Food at once, and that the Land may be manured by the Dung. Or (2.) by ploughing them in, (as before directed for *Pease*) at the Time of their Blooming about *Midsummer*, as the Season will permit. The Success which I have known from this Practice is almost incredible ; and I have from Observation found no Difficulty

Difficulty to believe, that Land thus managed once in Three or Four Years will easily regain its own Strength with little other Manure or Help, except proper and seasonable Tillage.

Lentils and *Tares* are also sown in many Places, where the Soil is but weak; because in *better*, they would run too much to Straw and rot on the Ground. A Bushel will sow an Acre, and the Increase is great; the Straw, if got well and dry, is as good as Hay for Cows and Horses. But eaten together as they grew, they give great Proof to Cattle, especially those that are young. These small Seeds are mightily admired by Pidgeons, because they are a hot Foot: And indeed they should never be wanted where there is a Dove-House. They need but one ploughing, and want little other Manure, but *ploughing* in of the last Stubble; because, like the aforementioned Pulses, they *enrich* the Land themselves. Some, who dare not trust Pease with the common Peoples Honesty, sow these small Pulses with their Beans, harrowing them in at the Top, after the other are sown under Furrow; which may be a very good Way, because they are easily parted with a Riddle.

Of CORN-GRANARIES.

IT is no small Advantage to the Publick, to the Husbandman, and to the Poor, to supply the Wants and Defects of scarce Years, by laying up and preserving of all sorts of Grain when it is cheap and good. For in a Time of Dearth and Scarcity, the Farmer hath little to sell to advance his Stock, or to pay his Rent; and the Buyers are often furnished with bad Corn from Foreign Parts, or from such as were ignorant of the Ways of preserving it. Therefore the Farmer had need be provident, and look about him to guard against Want; and in some of the Years of most Plenty, to make some use of the following Ways of making of *Corn-Granaries* for storing it up; led to it by these two forcible Reasons: That in *dry* Years, when it is always best for keeping, he is sure to buy *cheap*; and in *wet* ones, when keeping it is dangerous, he may be almost certain to sell *dear*.

I have already taken Notice of some of the best Methods for preserving Corn abroad in Stacks or Hovels set upon Stone or Wooden Posts with Caps over them, to prevent Mice getting into them: And by this means I have my self preserved considerable Quantities of Wheat unthreshed for three or four Years together; and have so far experienced the Advantage of it, that at the End of that Term I sold some for Eight Shillings, some for Nine, and some for Ten Shillings the Bushel; and yet I sold Wheat of the same Year's Growth, when I first laid it up, for Two Shillings the Bushel, and equally good.

But because there is an unavoidable Inconvenience that attends this Method of keeping Grain in the Straw; that the Farmer will want his Straw and Chaff for his Cattle to make Dung with: Therefore several Ways have been invented to preserve Corn after it is threshed, and likewise after it is cleaned and well dress'd. To keep it in the Chaff before it is winnowed is least difficult, and therefore often practised by those who have not better Conveniencies, contenting themselves to lay it in Chambers and Lofts, and so *dress* it as they want it. Others, to remove the Temptation of using it before dear Years come, thresh out the greatest Part of their Stock in *March*, leaving only one Hovel wherein to store the whole threshed Corn with the Chaff; laying it a Foot thick in five or six Layers, and betwixt each Layer dispose two Rows of Sheaves, and after this secure the Whole by good and sufficient Thatch. In this way it will keep many Years sound and good, if it be guarded from Accidents.

But because it may be thought there is some Danger, as well as Trouble, in this Method; most of the Farmers in *Berkshire*, and some of the neighbouring Counties, who have every Year near One Hundred Quarters of Wheat, and double the Quantity of Oats, think it worth their while, once for all, to build a Corn-Granary for that and *only that* Purpose, with Divisions in it for several Grains. Some are made with Chambers one over another, that the Corn may be let gradually through a little Hole from one Chamber to another till it comes to the Bottom, and then is carried up again as Necessity requires. Others make a single long Room made with Stone or Brick well laid in Lime, and plastered within with a thick Coat of Lime, Hair, and beaten Glass, or the Dust from the Smith's Anvil: These, well incorporated and harden'd, hinders the Mice and Rats from penetrating. And once in two or three Weeks they throw the Corn from one End of the Room to the other, keeping Windows open sometimes to the *North* and *East*;

but by no means suffering the *South* Air to come in. But still as these are subject to great Damps and Sweatings, and because it is almost impossible to be secure in this Way from the Danger and Damage of Rats and Mice.

The latest, best, and now most approved Practice, in those Countries where they have the greatest Quantities, and from whence there are greatest Demands by means of navigable Rivers, is to build their Granaries on Stone-Posts about two Foot high from the Ground, with Caps, (as before directed for making Hovels for Corn) multiplying the Posts according to the Length and Bigness of the Building desired. Some are built with Brick and Timber together; others only with Timber and Boards; as judging such will be least subject to Dampness and Moisture, and, which is still a greater Advantage, will admit the Air and Wind through the Crevices of the Wood and Boards, better than if it was entirely closed with Brick-Work.

Such sort of Buildings as these set upon Stone-Posts, are found to be extremely beneficial and useful, and may easily be made to contain two or three Hundred Quarters of Grain, with Room enough also to keep the Corn seasonably removed and stirred: And they are effectually secured from Mice, provided Care be taken not to lay any thing *under*, nor set any thing *against* the Building, that may give them a Passage: And accordingly the Stairs, by which Servants go up and down, are made moveable, and should be moved as Occasion serves.

All Places set apart for the keeping of Grain should be as free from Moisture and Dampness as possible, and as far from Stables of Horses, Oxen, or Swine as may be; inasmuch as all strong Smells attract Moisture, and give a musty Taste to Grain. Some prescribe the having the Walls and Floors to be washed with Vinegar, or a Decoction of bitter Herbs and Drugs; as, Leaves of Wormwood, Southernwood, wild Cucumbers, the Pulp or Seeds of Coloquintida, Beest-Galls, &c. And doubtless, no Worms, Vermin, or Weevils can bite or touch the Corn where these are used. But they who will not be at this Pains, may lay some Wormwood well dried underneath, above and upon their Corn-Heaps; or else let them anoint their Walls and Floors with Oil-Olive or Sheeps Urine. To powder the Floor under the Corn with green Oak-Ashes, is the present killing of all Mites. And to keep Grain from heating or chaffing, besides the afore-mention'd Removings, let there be laid under every Ten Bushels of Corn, One Bushel of Millet; or if it be mingled therewith, it is easily separated with a Sieve. But if it happen, that by the Moisture of the Weather, or Neglect of turning, any Grain prove musty, spread it thin on a Cloth, and let it lie out all Night in the Dew; and after it is dry'd well next day in the Sun, it will return to its Sweetness.

But because there are several other Things, besides the foregoing sorts of Corn and Grain, made use of and sown in the Way of Husbandry, and propagated in the Fields by the Plough; to make this Work as compleat and as generally useful as may be, I shall not forget to take Notice of them in this Place, and to explain their Nature, and the Method of Cultivation.

Of HEMP and FLAX.

HEMP must be sown in fat and well-dunged Grounds, and watered with some little Brook; or else in fat and moist Places, where much Labour and Ploughing hath been bestowed; for the fatter the Ground is, the thicker will the Bark or Pilling be. It must be sown in *March* or *April*, and gather'd when the Seed is ripe, and afterwards dried in the Sun, Wind or Smoak; and then laid in some Water to be watered, that so the Pilling may more easily depart from the Stalks, afterwards to be used in making of Ropes and Cloth.

Mr. *Worlidge*, in his *Systema Agriculturae*, says, Hemp delights in the best Land, warm and sandy, or a little gravelly, so it be rich and of a deep Soil: Cold Clay, wet and moorish, is not good; the best Seed is the brightest, that which will retain its Colour and Substance in rubbing; three Bushels will sow an Acre, but the richer the Land, the thicker it must be sown. From the Beginning to the End of *April* is the Time of sowing; according as the Spring falls out, earlier or later. It must be carefully preserved from Birds, which will otherwise destroy many of the Seeds; for which Purpose some scatter a thin Covering of light Straw.

The Season for gathering of Hemp is first about *Lammas*, when a good Part of it will be ripe; that is, the lighter Summer Hemp that bears no Seed, and is called the *Timble* Hemp, and the Stalk grows white; and when it is ripe, it is most easily discernible; which

which is about that Season to be pulled forth and dried and laid up for Use. You must be cautious of breaking what you leave, lest you spoil it: You are to let the other grow till the Seed be ripe, which will be about *Michaelmas*, or before; and this is usually called the Karle Hemp. When you have gathered and bound it in Bundles, of a Yard compass, you must stack it up, or house it, till you thresh out the Seed. An Acre of Hemp may be worth unwrought from 5*l.* to 8*l.* if wrought, 10*l.* 12*l.* or more. It is a great Succour to the Poor; the Hemp-Harvest coming after other Harvests, and in the Winter-Season, it affords Employment to such as are not capable of better.

Another Author gives still a more particular Account of Hemp, and says, the fittest Soil for it is a rich mingled Earth of Clay and Sand, or Clay and Gravel well tempered; and the best serves best for the Purpose, for the simple Clay or Sand are nothing so good: The best is called Red Hazel Ground, being well ordered and manured; and of this, a principal Place to sow Hemp on, is in old Stack-Yards, or Places wherein Winter-Sheep and Cattle are wont to lie. Some will preserve the Ends of Corn-Land which butt upon Grass, to sow Hemp or Flax on.

Now for the Tillage or ordering of the Ground, it must be at least thrice broke up, except it be some very mellow and light Mould, as Stack-Yards, and usual Hemp-Yards be; and there *twice* is sufficient, *viz.* about the latter End of *February*, and in *April*, when you may sow it reasonably thick with sound and perfect Seed: You must lay it shallow in the Earth, and cover it close and light, and with so fine a Mould as you can possibly break with your Harrows or clotting Beetles; and till it appears above-ground, you must carefully defend it, especially an Hour or two before the Sun rises and sets, from Birds and Vermin.

You need not weed it; for it is swift of Growth, rough and venomous to any thing that grows under it. When ripe, it must be pulled up by the Roots; and the Time is, when the Leaves fall downward, or turn yellow on the Tops; and this for the most part will be in *July*, if it be for Cloth: But for Seed, you must let the principal Buns stand till the latter End of *August*, and sometimes to *Mid-September*; and then the Seed being turned down and hard, you may gather it; for if it stand longer, it will shed suddenly.

As soon as you have pulled it, lay it flat and thin upon the Ground for a Night and Day at the most; and then, as Housewives call it, tie it up in Baits, and set them upright till you can conveniently carry them to the Water; which should be done as speedily as may be. When washed and dried, it is to be broke, and beat on Blocks, &c.

Flax is to be managed much like Hemp, except as follows: For it being more tender than Hemp, you must weed and trim it, till it gets above all the Weeds, and then it will shift for itself. Flax needs to lie in the Water less than Hemp. Whereas Hemp may be carried to the Water within a Night or two after Pulling; Flax must be reared up, dried and withered a Week or more to ripen the Seed: This done, you must take Ripple-Combs, and ripple the Flax over; which is the beating or breaking from the Stalk the round Bells or Bobs that contain the Seed; which you must preserve in some dry Vessel or Place till Spring, and then beat or thresh it for Use; and when your Flax is *rippled*, you must send it to the Water.

Flax, which ripens a little after the Hemp, you shall pull as soon as the Seeds turn brown, and bend the Head to the Earthward; for it will afterwards ripen of itself. The Seed of Hemp is a proper Food for Birds; and it will make Poultry lay Eggs often in the Winter: Some with the Coals of the thickest Roots of Hemp-seed make Gunpowder.

Before I leave this Head, it should be taken Notice of, that Flax grows and thrives exceedingly in new broken up Ground that is rich and mellow; and there it is commonly sown for a full Crop. There is only one Inconvenience which sometimes attends it in such Grounds, *viz.* that the Grub, a black and fulsom Insect, such as eats Cabbages and Cauliflowers, will in some Years seize it, and if not destroy'd in Time, will greatly damage the Crop. The best way to remove this Evil, is to gather them up in *May* before Sun-rise; for then they all appear above-ground working their Mischief. But as soon as the Sun is up, they retire an Inch or two within the Surface.

N. B. In *Derby* and *Nottinghamshire*, where a great deal of Linnen is made, they have found out an expeditious Way of saving the laborious Work of *Beating Hemp*. They make the Axle-Tree of the great Wheel of their Corn-Mills longer than ordinary, and place Pins in them to raise large Hammers, like those used for Paper and Fulling-Mills; and with the Help of these, they remove that laborious Work from Mens Hands, and beat most of their Hemp.

Of

THERE is nothing, which of late Years has turned to greater Profit to the Farmer, than sowing of *Turneps* in his Fields; which not only give quicker Feed and Proof to Cattle than Grass; but also enrich the Land, and dispose it for good Crops of Corn afterwards, provided the Work be carried on with Knowledge and Discretion. And that I may give some seasonable Directions herein, and because the Practice has met with great Discouragements from the Ignorance of some, and the Rashness of others; I shall be particular in laying down proper Rules, and directing the most likely means, that thereby the End of Riches and Improvement may be most effectually answered.

The *Turnep* hath been formerly thought to be a Root only fit for the Garden and Kitchen Use; but the industrious Farmer finds it now to be one of his chief Treasures, as (if rightly managed) it brings him in the greatest Profit. There are reckoned to be only three sorts of them, all of them equally good, if suited to a proper Soil; the *Round*, which is the most common, the *Yellow*, and the *Long*, which requires something a deeper Soil than the other. It delights in a warm, mellow and light Ground, rather gravelly and sandy than otherwise: However, there is hardly any Soil which it refuseth, except it be a strong untractable Clay; for the poorest Soil, with a little Pains and Cost, may easily be made to be a fit Recipient for it.

From the Beginning of *June* to the Middle of *August*, is a proper Season for sowing them for Winter Use. If they are sowed sooner, they run to Seed; and if much later, they will not have Time to *apple* well (as they call it) before Winter. The Land where they are to be sown, should be fallowed once or twice, and made as fine and free from Clots with the Harrow as may be. After which, in *June*, *July* or *August*, as the Season serves, the Seed may be sown and harrowed in with a Bush or Thorns on the Back of the Harrow; and, if need be, rolled also to break the Clots, and lay the Land level for houghing; which is a Work that must by no means be neglected, though it is too often thought unnecessary; for the *Turneps* will never bottom well without houghing, and yet the *Bottoms* are much more profitable to Cattle than the *Tops*.

For which Purpose therefore, when the Plants have two or three Leaves apiece, a dexterous Artist provides a Hough about five or six Inches wide, to determine in great measure the Distance of the Plants; and so by fixing his Eye upon one only at a Time, he proceeds regularly, and clears his Way. One Man at Twelve-pence a day Wages, will finish an Acre in four days; but there is sometimes a Necessity to run over them again a second Time with the Hough; which Labour and Charge will be more than doubly repaid in the Goodness of the Crop. If too much Wet, or the Richness of the Ground, cause them to run too much to Leaves, which is a Fault, the feeding of them, or running over them with a light Roller, will much help their rooting.

But forasmuch as *Turneps* are directed to be sown about *Midsummer*, which frequently proves so dry that the Seed will not come up for want of Moisture; therefore the Season is carefully to be watched, and the Seed should be sowed after a Shower, or if possible before it. And if, notwithstanding this Care, the following Season prove so dry that the Seed will not come up, there is yet room for a second and a third Attempt, and no Place for Discouragement: For the Seed is cheap, and runs a great way, and the Trouble of harrowing it in a second or a third Time not very great. The greatest Misfortune which attends the *Turnep* in Summer is, they are subject to be eaten with a little black Fly at their first coming up, chiefly where the Land is over-poor and worn out: To prevent which, some propose the sowing *Soot* upon them. However, (as was before observed,) the Seed is cheap, and the Labour of re-sowing small; and, which is a valuable Circumstance, the Farmer has Time enough to look about him.

Some sow them upon the Stubble as soon as the Corn is off, and only harrow them in; which will prove a good Relief in the Spring to Ewes and Lambs, especially if sown on such Land as is intended to be fallowed; for then they may remain till the Beginning of *May*, the scarcest Time for Food; and yet if a hard Winter should destroy most of them, the Loss of Seed or Labour will not be much.

But for the Management of such as have been sowed and taken care of in the proper Season, as there have been great Mistakes, so it will be the more necessary to give some Directions. In *Suffolk*, and many other Places, they are wont to give the *Turneps* to Cattle in the House, as judging they feed faster, and do no harm with their Feet. And in this Method, some cut the *Turneps* in Pieces to make the Food readier for large Cattle: But because this has sometimes proved fatal, in tempting them to swallow it without chew-

ing, and so choke them; therefore others give them *whole*, and think their Cattle thrive and grow fat without the Trouble and Danger of cutting. If large Cattle are to be fed with *Turneps*, the last Method is undoubtedly the best and safest. But

There is a much more profitable Way to the Farmer than either of these, which is little taken Notice of, and yet I think should be universally practis'd, *viz.* to eat the *Turneps* in the Winter with Flocks of Sheep; either *Weathers* to make them fat, or *Ewes* the better to feed their Lambs; not suffering them however to ramble over the whole Field of *Turneps* at once; but confining them by way of *Folds* and *Hurdles* to small Parcels at a time, till they are thoroughly eaten; and then removing the Fold to another Place; and so on till the Whole is consumed both Top and Bottom.

This Method is much to be preferred to any of other Ways, for these following Reasons. (1.) Because the Danger of choaking Cows and Oxen, as well as the Trouble of gathering the *Turneps* for them, is hereby avoided. (2.) Because taking the Crop from the Land is a great Wrong to it; and the End of Improvement by this Method, with respect to the Land, is lost. But (3.) which is most considerable, this Method of eating them with Sheep, gives such a strange and uncommon Fertility to even the poorest Land, that two or three good Crops of *Barley*, *Wheat* and *Rye* may be depended upon afterwards, with little other Manure but good and seasonable Tillage.

It must be owned to be a Piece of great Neglect in the Farmers of the *North*, that they are not easily to be brought into this Piece of good Husbandry; and have little else to say to excuse themselves from the Practice, but that the common People would rob them of the best Half. Whereas, if we could suppose neither Law nor Justice would restrain them; yet, if it was once become the common Practice of the Country, the Loss sustained by Thievery would fall amongst a great many, and consequently be the less discernible and hardly worth lamenting.

If it were but well considered, what a great Number of Sheep an Acre of *Turneps* will sustain, even *Twenty* during the Winter-Season, and make them likewise fat by *Lady-Day*, both the Grazier and Farmer would join issue with this Reasoning supported by Experience; especially seeing the Land need not be very rich, and that they may be sown as a second Crop sometimes after early Pease; and that the same supplies the great want of Fodder during the Winter, not only for fattening Beasts and Sheep, but also for Milk.

Every one knows that the *Turnep* is an useful and much approved Root for the Kitchen; and yet it is remarkable, that the Cows, Oxen and Sheep eat them greedily enough, Hogs will not touch them.

I was lately inform'd by a Friend, that he hath frequently received great Relief and Benefit in severe Fits of the Gout and Rheumatism from only a Poltice of *boiled Turneps* mash'd, and laid on the Part most affected as hot as can well be endured; and this he repeated twice a day to his great Ease.

I cannot here forbear mentioning a Conjecture (grounded on a surprising Observation mentioned in the *Transactions* of the R. S.) to shew the Reason why *Turneps* improve Land. They will often increase Eleven, Twelve, Thirteen, nay more, perhaps many more times the Weight of the Seed every Minute from the Time they are sown to the Time they are drawn, at least till they arrive at their full Bigness. This Nourishment is in great measure probably fetch'd from the Earth below the reach of the Plough, and so the Vegetable Matter which would otherwise have always lain idle, is drawn up near the Surface. Besides also, since we not only *perspire*, but also *attract* through our Pores; and since we are sure the *Sedum Arborescens* can gain great Nourishment from the *Air*; it seems probable that *Turneps* also may collect from the *Air* vast Nourishment, and so by being suffered to rot, give the Soil Vegetable Matter which it never received from thence. The Fact on which this is built is certain, and the Reason is at least plausible and worth considering. *Turneps* therefore may not only *open* and *mellow*, but truly *enrich* with new Materials the Earth: And this (if true) may shew why some Plants so terribly impoverish the Earth, whilst others do it no harm; some throwing off by Perspiration vast Quantities of Vegetable Matter into the Air, others receiving and retaining much from it.

Of CARROTS.

THE Carrot, *here*, is to be treated of, not as a *Garden* but a *Field-Plant*; for in many Places, where the Soil is proper, they sow an Acre or two of them together, especially near *London*, where there is a large Consumption, and for the Advantage and Profit of the Seed. Their Roots running considerably downwards, the Plough will hardly give sufficient Tillage, except where the Ground has been digged to bring up a new and fresh Soil, which in many Places is practised with Profit and Success: *Here* indeed it is of singular Advantage to sow Carrots, which require much the same Care in houghing as Turneps, and delight chiefly in a rich warm light Soil, rather inclining to Sand. There are two sorts of them, the *Yellow*, and the *Red*; and the latter is much to be preferred for the Kitchen. Both sorts answer the Farmer's Expectation and Profit, chiefly in feeding his Hogs, and sometimes his Geese. The Place where they grow should be well fenced, and the Seed sown the latter End of *February*.

Of RAPE and COLE-SEED.

THE sowing *These*, is another excellent Piece of Husbandry, in proper Soil; for marshy and fenny Lands, especially such as hath been newly recovered from the Sea, admit these with great Improvement: But indeed, almost any Land that is warm, rich, and not over wet, is proper for Rape and Cole-seed. The best of which is usually brought from *Holland*; and four Pounds of it, which costs not above four Pence, will sow an Acre.

The Time of sowing it is about *Midsummer*; but the Land must be twice fallowed, and laid even and fine with the Harrow before it is sown. The chief End of sowing it, and for Use, is Oil; of which it affords a great Quantity, and for which there is a great Demand. But there is besides another End in sowing it; for it is a great Support to Cattle in the Winter-Months, when other Food is wanting. In the more ordinary sorts of Land, this is indeed the chief Use of it; because only in the richest Lands, where it grows strongest, it is reserved for Seed.

Sometimes, if the Winter prove mild and open, it produces a good Crop the next Year also; and even after cutting, the Stubs thereof will sprout and afford great Relief to Sheep; which are cautiously to be trusted with it at first, for fear of bursting them. What is reserved for Seed, is generally reap'd as Wheat, after it begins to look brown, letting it lie near a Fortnight to dry, without stirring it, lest it shed its Seed. To avoid which Danger, it is either wont to be threshed in the Field on large Sheets, or therein they carry it to the Barn and thresh it immediately. It is observed that Barley and Wheat do very suitably follow these Crops, as finding the Land well disposed for them.

In *Lincolnshire*, Mr. *Mortimer* observes, where Fuel is scarce, after the Oil is pressed out, they burn the Cakes to heat their Ovens: But if the other Use he mentions be to be depended upon, it is much better; for in *Holland*, he saith, they feed their Cows with them in hard and scarce Winters; and in some Parts of *Northamptonshire*, (near the Fens I suppose) they give it their Calves from three or four days old, instead of Milk; with which they thrive, till they come to eat Grass and Hay.

Of WOAD.

THIS being a very rich Commodity, it is worth the Husbandman's Notice and Care in cultivating it; because it is often found, that he *doubles*, nay *quadruples* the Rent of his Land thereby. The chief Misfortune is, that it will not thrive every where; for it requires a very rich and warm Land, and such as hath not been used in Tillage for some Years; and *here* also no more than two Crops must be expected; only it admirably disposes the Land, and makes it clean for Barley afterwards.

It is observed of late Years, that there are many Sets or Companies of People, Men, Women and Children, who undertake the *Whole* of this Business; hiring Land, building Huts or Houses, ploughing the Land, sowing the Seed, gathering the Woad, and doing every thing else to fit it for the Dyer's Use. And so, when their End is answered, they remove from Place to Place, as they can find Land for their Purpose.

The Land must be finely ploughed and harrowed for this Seed, leaving no Stones, Clots or Turfs thereon; and it must be continually weeded till the Leaves cover the Ground. Early sowing, it is thought, greatly prevents the Fly and the Grub, to which it is subject as well as the *Turnep*; accordingly, if the Weather suffer, it should be sown in *February*.

The first Crop is ripe, when the Leaf is come to its full Growth, and retains its lively Greenness; and then no Time should be lost in cutting it, lest it grow pale and fade, which would be a great Prejudice to it. It ordinarily yields four, and sometimes five Crops in a plentiful Year, besides the Winter-Growth, which is very helpful to Sheep. The two first Crops are the best, and therefore should not be mixed with the other, but carried immediately to the Mill separate; and the ordering of it *there*, is best learnt from experienced Workmen. It sells from six to thirty Pounds a Ton, which is the ordinary Produce of an Acre. Before the Ground is ploughed the second Year, they reserve a Place by itself, where are some of the best Plants; and these are preserved for Seed for future Use. It is used by Dyers to lay the Foundation of many Colours, especially those that are dark.

Of W E L D.

THIS is a rich Commodity, useful also to the Dyers for all sorts of bright Yellows, and Lemon Colours; and is the more valuable, considering the easy Charge of raising it, and that it will grow upon some of the worst Land. *Weld* is one of the capsulate Herbs, whose Flowers consist of four Leaves; and is further distinguished by the Flower in respect of its Colour, being a yellow large Plant, whose Leaves are of a bluish Green, long and smooth.

It is remarkable, that in many Places, particularly in the Bishoprick of *Durham*, it grows wild; and yet is there much neglected, by reason neither the Plant nor its Value is ordinarily known.

However, it is sown with Care in many Places of *England* to great Advantage; for, as I have observed, it will grow on any ordinary Land, provided it be dry and warm. It may be sown after Barley or Oats when they are harrowed, this requiring only a Brush to be drawn over it. A Gallon of Seed will sow an Acre, it being very small; for which Reason it is good to mix it with Dust or Sand, by which Means it may be the better dispersed with the Hand. It grows not much the first Summer; but by preserving it from Beasts and Annoyances after the Corn is gathered, you may the next Summer expect a Crop.

The Seed should be carefully gathered before it is too ripe, lest it shed. It is pulled, as they do Flax, by the Roots, and bound in little Handfuls, set to dry and then housed. After this, they beat out the Seed, which is of a good Value; and sell, not the Leaves, but the Stalk and Root to the Dyers, for the Uses aforesaid. The Seed is sometimes worth Ten Shillings a Bushel; and the whole Value of an Acre's Crop, Seven or Eight Pounds.

Of S A F F R O N.

THAT which grows in *England* is esteemed the best in the World, and should therefore be more propagated than it is. *Saffron* is of the *Crocus*-kind, of which there are great Varieties both of Vernal and Autumnal Flowering. But the true *Saffron* appears in *September*, with Flowers like a blue *Crocus*; and in the Middle of it come up two or three Chives growing upright, as the rest of the Flower explains itself and spreads abroad.

It delights in a warm mellow Soil well cultivated, and is planted and increased by the Roots; set according to some in *March*, and by others at *Midsummer*, when its Leaves die into the Ground. This Root is much propagated in *Cambridgeshire*, and about *Saffron-Walden*, from whence it takes its Name; and there they set them in Ranges, which they make with a large Hough about two or three Inches deep, and at five Inches distance one from another. After one Range is finished, they begin another; covering the first with the Earth of the second Range; and so on till the Whole is finished, setting each Root three Inches asunder.

The Time of Gathering is, when it first begins to flower in *September*, when the yellow Chives appear in the Middle of the Flower, which are gently to be gathered by the Finger and Thumb early in a Morning before it retires into the Flower again. For this purpose as many Hands are to be employed as the Quantity of the Land requires, and as long as the Season continues, which is about a Month. It must be dried with a gentle Heat and constant Attendance; whereby it must be expected that at least two Thirds will dry away and lose its Weight; by which it is generally sold, and at a dear Rate too sometimes, even from Twenty Shillings to Five Pounds a Pound Weight; an Acre usually producing Ten or Twelve Pounds. Out of this Profit is indeed to be deducted the necessary Charge of Planting, Houghing and Gathering, which is usually computed at Four Pounds an Acre: However, as they continue in the Ground increasing and multiplying at the Root, and need not be removed or planted only once in three Years, the Charge of *Planting* must not be accounted annual.

Mr. *Mortimer* tell us, that in some Parts of *Oxfordshire* there is a sort of Bastard-Saffron called *Safflow*, which the Dyers use for Scarlet, which they plant in Rows about a Foot distance for the Convenience of houghing. It grows upon a round Stalk three or four Foot high, and at the Top bears a great open stalky Head, out of which proceed many gold-coloured Threads of a most shining Colour, which they gather every day as they ripen, and dry them.

We have Saffron brought from *Spain*; but it is a sort much worse than our own Growth, and of much less Value.

Of LIQUORICE.

THIS being a Plant that brings in great Profit to the industrious Planter, I thought it proper to give it a Place here, and to say something to direct and to encourage its Cultivation. It grows naturally wild, and in Soils not over-rich. I find it my self extending its Roots even amongst the Lime-stone Rocks, but very small and slender: However, it deserves better Encouragement, for its Productions are always answerable to the Goodness of the Soil. It loves a deep, warm and rich Earth inclining to Sand; accordingly it hath been much planted near *Northampton* and *Pontefract* in *Yorkshire*, where the Land will bear trenching at least three Spit deep, and should be laid as light as possible. If Dung is used to mend the Soil, it should be dug in before Winter, and at planting in the Spring dug over again. Old rotten Dung is best.

The best Sets are those taken from the Top of the old Roots; but the Runners also, which spread from the Master-Roots, may be made use of with great Success. Even the Branches when slip'd and planted will grow in a wet Year, and will serve to fill up all thin Places.

February and *March* are the Months for planting *Liquorice*. The Plants are set with Sticks at about a Foot distance; and because they are impatient of the Sun or Wind, they should be as little out of the Ground as possible; and consequently, if they are removed to any distance, great Care should be taken that the Roots be kept moist. The first Year after Planting need not be lost, for *Onions* and *Lettuce* may be sow'd intermixt.

After it has stood three Years it may be dug up for Use; and the sooner it is disposed of the better for the Planter, because while it is green it preserves its Weight. We are told, that One Hundred Pound hath been made of an Acre of *Liquorice*; but, I suppose, now the Plenty diminisheth its Value. However, this is certain, that the better the Land is the more is the Profit, every one coveting the largest.

This is a considerable Article in the Apothecary's Shop, and is used medicinally various Ways.

Of Madder.

MADDER is an Herb that is *stellate*; so stiled from the Manner of the Growth of the Leaves, which encompass the Stalk at Intervals, like the Rays of a Star, distinguishable by bearing lesser Flowers, ramping, of broader Leaves, having a red Root used for dying Scarlets.

The Sum of what Mr. *Worlidge* says of Madder, in his *Systema Agriculturae*, is, that it is a rich Commodity much used by Dyers and Apothecaries, and a Plant that delights in our Climate. It is to be planted in a very rich, deep, warm and well manured Land, dug at least two or three Spade deep: About *March* or *April*, as soon as it springs out of the Ground, it is to be there planted. The Sets are to be gathered two or three Inches long, with Roots to them, and immediately planted, or put into Mould, if carried far; and then set about a Foot apart, and kept watered till they spring, and continually weeded till they have gotten the Mastery of the Weeds. At three Years end you may take it up; reserve the Plants for the Use of your self or Neighbours, and sell the Roots to the Apothecaries, or dry them for the Use of the Dyers.

Dr. *Sprat*, in his *History of the Royal Society*, gives an *Apparatus* to the History of the common Practices of Dying, by Sir *William Pettit*. He says, Bran-Liquor contributes something to the holding of the Colour; for we know Starch, which is nothing but the Flower of Bran, will make a clinging Paste, the which will conglutinate some Things, tho' not every Thing, *viz.* neither Wood nor Metals. Now Bran-Liquors are used to mealy dying Stuffs, such as Madder is, being the Powder or *Fecula* of a Root; so as the Flower of Bran being joined with the Madder, and made clammy and glutinous by Boiling, he doubts not but both sticking upon the *Villi* of the Stuff dyed, the Madder sticks the better, by reason of the starchy Pastiness of the Bran-Flower joined with it.

Madder is a Root cultivated much in *Flanders*; it is used to dye on Cloath a Colour the nearest to our Beau-Dye, or New Scarlet; and the Colours called Bastard Scarlet are dyed with it.

Sometimes the Madder hath yielded Eight or Nine Pounds the Hundred Weight; the best more, and the worst something less; for there is great Difference in its Value: It is Pity it is not more cultivated, inasmuch as there is a great and constant Demand for it, both from the Apothecaries and Dyers. Some of the latter have been known to use a Hundred Pounds worth in a Week.

Of Teasils.

MR. *Mortimer* tells us, that in several Parts of *Essex* they sow *Teasils* upon Lands already ploughed for Corn in *Autumn*, double-furrowing it in *December*; and after that, in *February* or *March*, they sow the Seed, a Peck upon an Acre. But in *Berkshire*, and about *Reading*, a Friend of mine is wont to cultivate several Acres of *Teasils*: But he manages them after a better and more rational Method, and finds a very good Account and Increase in it. The Plants ought to have two Summers to bring them to Perfection, like Cabbages. Only they should be sowed in the Spring, and suffered to stand in the Seed-Bed all the Summer cleanly weeded; and then either in *Autumn*, or in *Spring* following, transplanted into the ploughed Field, ready prepared for them; where they are to be set regularly in Lines at about a Foot asunder. By which Management, they arrive to great Maturity and Bulk. This is a Commodity that is carried from *England* into Foreign Parts, being no where else (as far as I can learn) cultivated. They are used in the dressing *Bays* and fine *Cloths*; and only this kind of Thistle is fit for the Purpose, and is so necessary for that End, that the *Dutch* eagerly covet them, and purchase them almost at any Rate. There have formerly been vast Advantages made of them; an Acre commonly producing One Hundred and Sixty Bundles, at One Shilling a Bundle, and sometimes double. But I suppose the Markets of late have been more glutted or over-stock'd. They cut them in *August*, tying them up in Bundles or Staves to dry before they house them. A mixt loamy Soil is supposed to be best for them.

Of Hops.

THE *Hop* is an Herb of Staminate Flowers, whose Seeds are round, distinguishable by Sex of Male and Female; because from the same Seed some Plants are produced which bear Flowers and no Seeds, and others which bear Seeds and no Flowers.

It is of the bigger sort of Herb, having a divided Leaf, and being a climbing Plant, twisting about such Things as are next to it, from the *Left* toward the *Right* Hand, contrary to the manner of some other twining Plants; of a rough roundish Leaf, divided into many Segments, with a Head of scaly Tufts growing in a Cluster or Bunch. It is commonly used to preserve Drink from sowering, and will preserve it sometimes Fifteen or Twenty Years.

This Plant delights in the richest Land, a deep Mould and light; if mixt with Sand it is the better; and a black Garden Mould is excellent. To lie near the Water, when it may be laid dry, and have a low mellow deep Ground, inclining Southward, and defended by Hills or Trees from West, North and East, that it may lie warm, is best; but almost any Ground may do, except stony and stiff Clay. The *Ash* on a dry, and the Poplar or Aspen on a moist Ground, make the best Shelters to the Hop-Garden.

If the Land be cool, stiff, sour or barren, burn it at the latter End of the Summer, and then sow Turneps, Hemp or Beans, to mellow and lighten the Ground, and destroy the Weeds. Whatever it be, *Till* it in the Beginning of Winter with Plough or Spade, making it even; and marking out the Places where the Hills are to stand; which is best done by a streighten'd Line over-thwart the Ground, with Knots at the Distance you intend the Hills.

Some plant Checquer-wise; which is best, if you would plough between the Hills: Others plant in the *Quincunx* Form, which is most beautiful and better for the Hops, especially in a small Ground where you must use a Breast-Plough or Spade. In either pitch a Stick, where each Hill is to be; and if the Ground be cold or stiff, lay on it the best Mould, or Dung and Earth mixt; and at every Stick dig a Hole about a Foot square, and fill it with the Mould or Compost, and there set your Plants, which will soon repay your Charge and Trouble.

Hops in a dry Ground are planted about Six Foot distant; but in deep, moist, rich Mould, that will bear large Hops, Eight or Nine Foot is the proper Distance; and so plant according to the Goodness of the Soil. If the Hills are over-distant, increase the Roots in each Hill, and so you will apply more Poles; and if the Hills are less distant, *contra*.

A great many plant at the latter End of *March*, or in *April*, and this is the common Practice; but undoubtedly it is best in *October*, when the Hops will settle against the Spring. Get the largest Sets from a Garden well kept, and where the Hills have been raised very high the preceding Year, which will increase the Plants in Number and Bulk. Let the Plants be Eight or Ten Inches long, and in each Three or Four Joints or Buds: Dig the Holes Eight, Ten or Twelve Inches deep, and about a Foot over, before you take the Sets out of the Ground; else you must lay them in cold and moist Earth, and take them out as you have Occasion. Some set Two or Three Plants upright in the Middle of the Hole, and hold them hard together with one Hand, while they fill the Hole with the other with fine Mould made ready before-hand, observing to set the Tops even with the Surface of the Ground, and then fasten well the Earth about the Roots. Others plant one Set at each Corner of the Hole, which is well approv'd; and 'tis good to raise the Earth Two or Three Inches above the Set, unless you plant so late that the green Sprigs are shot forth, when a total Covering will destroy them.

If Hops are worn out of Heart, then about the Beginning of Winter dig about them, and take away the old barren Earth, and apply good fat Mould or Compost to their Roots; be sure this be done before *February*, in open Weather; and such Winter-Dressing will renovate the Hop, and destroy the Weeds; but for hearty strong Hops, late Dressing is most proper, *viz.* in *March* or the Beginning of *April*, which will keep them from too early springing, that brings many Injuries.

In Dressing of your Hops, pull down the Hills, and undermine round, till you come near the principal Roots, and then take the upper or younger Roots in your Hand, shaking off the Earth; which Earth being removed with your Tool, you shall discern where the new Roots grow out of the old Sets, which Sets you must be careful not to spoil. You need not mind the other Roots, for they may be cut away, except such as you mean to set

set. Uncover only the Tops of the old Sets in the first Year of Cutting; and at what Time soever you cut down your Hills, cut not the Roots before *March*.

At the first Dressing, you are to cut away all such Roots or Sprigs as grew the Year before, out of your Sets, within one Inch of the same. Our ancient Writers say, they must be cut close like Officers; but Experience teaches, 'tis good for a weak Hop to leave some principal new Shoots at the Dressing, and that clean Cutting hath very much damaged a Hop-Garden. Cut not the Roots that grow downward, but such as grow sideways which may incumber the Ground. The old Roots are Red, the last Year's White. When you have dress'd the Roots, then apply your rich Mould or Compost prepar'd for that purpose; and make the Hill not too high at first, lest you hinder the young Shoots: When you dress you may cut the Hops, tho' they are sprung out of the Hills. Be sure to keep Poultry from the Hop-Garden; and if there be any wild Hops, take up the whole Hill and new plant it.

Provide Poles enough according to the Distance of the Hills, and according to the Strength of the Hop, the Length and Bigness. If the Hills be far distant, set Four or Five Poles to each Hill; otherwise Two or Three. In hot, dry and hungry Ground, the Poles may stand thicker than otherwise. If the Hops be strong, and the Ground rich, you are to get large Poles; if otherwise, the contrary: For the Hop will run out of Heart, if over-poled; and be sure not to over-pole the first Year, altho' they should require as many Poles (or rather Rods) the first as any other Year. *Alder* Poles are esteem'd the best, by reason of their Streightness, taper Form, and rough Rind, which suffers not the Hop easily to slip down: The *Ash* is most lasting, especially if they grow on barren Lands; some will last Ten or Twelve Years. *N. B.* Forked Poles bear the greatest Burdens.

Lay the Poles between the Hills before you begin to set them in the Ground. *Pole* when you see the *Hops* above Ground, and continue till they are a Yard high; but set the largest Pole to the strongest Branches: And so deep likewise, that it may sooner break than arise out of the Ground by Winds. Let the Poles lean outward one from the other, and stand equi-distant at the Top, to prevent growing too near each other in any Part; which will make Shade, and cause more Hawk than Hops. *N. B. Leaning Poles bear most Hops.* Be sure to preserve a Parcel of the worst Poles, in case a Pole should break, or be over-burden'd. Ram the Earth on the Out-side of the Pole, to secure it from Winds. If the Hop be under or over-poled, you may unwind it, and place another in its stead, having some one to hold the Hop, whilst you pitch in the Pole; or you may place another near, and bring the Hop to it.

When the Hops are Two or Three Foot out of the Ground, wind them on the nearest Poles, or such as have fewest Hops; or at least place them to the Pole, that they may wind themselves with the Course of the Sun, binding them gently thereto with some wither'd Rush or woollen Yarn; Two or Three Strings are enough to a Pole: 'Tis best doing this when the Warmth of the Day hath toughened the Shoots; in the Morning 'tis more dangerous. During the Months of *April* and *May* the Hops must be daily directed, lest they break themselves by going amiss: And a forked Wand, a Stool, or a Ladder with a Stay on the Back, are of use to direct the Hops to the Poles. About *Midsummer* the Hop begins to leave running at Length, and to branch; therefore such as reach not the Top of the Poles, it would be well to nip off the Top, that it may branch the better, which is preferable to their growing in Length: But Care should be rather taken not to over-pole them; for they never bear well, except their Extremities be suffered to hang down Five or Six Foot. And this, by the way, is another Demonstration that Vegetables are least prolific in a perpendicular Posture, and most prolific in an horizontal or inverted one.

To make up the Hills, after Rain in *May*, pare the Surface with a Spade or Hough, or run it over with a Plough; and with these Parings raise your Hills in Height, burying and suppressing all superfluous Shoots of Hops and Weeds. Thus will you hinder the Droughts in Summer to injure them, and the Hops will send forth their Roots to the Surface of the Earth, and thereby they imbibe what Moisture shall happen. This Work may be continued throughout the Summer, but more especially after Rain.

Be sure to keep your Ground in good Heart; and in a dry Spring, water your Hops before you raise your Hills. In hot and dry Grounds a dry Spring checks the Hop in its first springing. Use what Water you can get; but what is gotten in a Pond made with Clay, at the lower End of your Ground is best. In the midst of each Hill thrust some pointed Stick or Iron down the Middle, and pour in your Water by degrees till the Hill

is well soaked; then cover the Hill with the Parings of your Garden. In a dry Summer give each Hill a Pail-full of Water two or three times: After every Watering make up the Hills with the Parings, Weeds, the coolest and moistest Materials you can get; for the more the Root is shaded, the better it thrives; even many fare well that have natural Shelter and are never drest.

Towards the End of *July* Hops *blow*, and a Week or Fortnight after they *bell*, and in forward Years are ripe the latter End of *August*. When the Hop or its Seed turn a little brownish, or when they are easily pulled to pieces, and smell fragrantly, conclude they are ripe, and gather them with many Hands before they shatter, for a Wind may do great Damage.

The way of Gathering is to take down four Hills in the midst of the Garden; cut the Roots, level the Earth, throw Water on it, tread and sweep it, and so shall it be a fair Floor to lay the Hops on for Picking. On the Outside of this Floor the Pickers sit and pick the Hops into Baskets, the Hops being stript from the Poles, and brought to the Floor. Clear your Floor twice or thrice in a Day, and sweep it clean. This is best for strait Poles, and some pick them sitting dispersedly: But the best way is to fasten a Hair Cloth or Blanket on a Frame made of short Poles, and set on four Stakes; on which lay the Poles with the Hops on them, and pick them into the Blanket; when 'tis full, remove them, and so on, removing the Frame as occasion serves. This Way saves stripping the Hops from the Poles; neither are any scattered by stripping, and they are all in Sight, and sooner pick'd.

Before you draw your Poles, with a sharp Hook on a Pole divide the Hops where they grow on two Poles, and cut them Two or Three Foot above the Hills, else the Hop will bleed much of its Strength away. This done, draw your Poles; and if they are over-fast in, draw them with an Iron Pair of Toothed Tongs, or a Wooden Leaver forked, on which are fixed two Toothed Irons; either of these laid over a Block Leaver-like, will easily raise them. Draw no more at a Time than what will serve for an Hour or two, in case of very hot Weather, or likelihood of Rain.

In a large Hop-Garden, 'tis worth while to raise in the midst thereof a Shed, under which you may pick your Hops; which will defend both the Hops and the Pickers from the Sun and Storms. Here also may be laid Hops unpick'd over Night, to be picked in the Morning before the Dew be off the other; and the Poles may lie here dry in Winter.

Gather no Hops wet; but if the Dew or Wet be on them, shake the Poles and they will dry the sooner. Let not your Hops be over-ripe, lest they shed their Seed (in which their chief Strength consists) and lose their green Colour, to the Prejudice of their Value; tho' some Persons let them stand as long as they can, because they waste less in the Drying. Four Pounds of green Hops thorough ripe will make One Pound of dry, and Five Pounds in their Prime will make One; so they think they get more in the Weight than they lose in the Colour. In Picking, keep them clean from Leaves and Stalks, which will spoil their Sale. As fast as you pick, dry them, otherwise they will change Colour; but if you must keep them, spread them on some Floor, not too thick, and by that means the Damage they will receive in a Day or two will not be great. *N. B.* Ill dried Hops are naught, and will spoil all they come nigh.

Some make use of the broken Poles to dry their Hops; but Charcoal or Cinders are the only Fuel which will not prejudice the Colour, as smoaky Wood will: Keep your Fire at a constant Heat; and the Hops this way must not be stirred till thorough dry, which is when the Top is as dry as the Bottom; but if any be not so dry as the rest, (which may be known by their rattling, if you try with a Stick in several Places) then abate them there, and dispose in the Places where Hops were first dry. When they are all dry through, then take out the Fire, and shove out the Hops at the Window, with a Coal-Rake made with a Board at the End of a Pole, into the Room prepared to receive them; then go in at the Door below, and sweep together the Seeds and Hops that fell through, and lay them with the other. This done, lay another Bed of green Hops, and in like manner proceed.

In several Places they dry their Hops on the ordinary Malt-Kilns (on a Hair-Cloth) about six Inches thick; and when they are almost dry, with a Scoop made for that Purpose, they turn them upside down, and let them lie till every Hop be thoroughly dried; and then with a Hair Cloth remove them to the Heap. - Both these Ways are subject to Inconveniencies. In the first, the Hops lying so thick and never turn'd, those under must of Necessity be over dry, before the upper can be dry enough, and prejudice them both
in

in Strength and Weight; besides the Waste of Firing, which must be long continued to thorough dry so many together. In the second Way, the Turning of the Hops breaks them very much; by forcing the Scoop against the rough Hair Cloth, it frets and spoils many Hops, and shatters their Seeds, else this Way is rather to be preferr'd.

But these several Inconveniencies may be prevented, by making the lower Part of the Kiln, as before described, and the Bed after the following manner: First, make a Bed of flat Ledges about an Inch thick and two or three Inches broad, sawn and laid a-cross on the other Chequer-wise, the flat Way, the Distances about three or four Inches; the Ledges so entered the one into the other, that the Floor may be even and smooth; and this Bed is to rest on two or three Joists set Edge-wise to support it from sinking. Cover this with double *Tin* Plates solder'd together at the Joints, and so order it that the Joints of the *Tin* may lie over the Middle of a Ledge: When the Board is wholly cover'd, fit Boards about the Edges of the Kiln to keep up the Hops; only let one Side be to remove, that the Hops may be shov'd off. On this *Tin Floor* the Hops may be turned without Hazard or Loss, as before on the Hair, and with less Expence of Fuel: Also any Fuel will serve, for the Smoak cannot pass through the Hops; but be sure to have Conveyances for it at the Corners and Sides of your Kiln. The Fuel you will save, will in a little Time recompence your Charge.

To turn Hops, is troublesome; but a wooden Cover lined with Tin, to pull up and down, and to hand sometimes about a Foot over, will, like a reverberatory Furnace, dry the upper Parts. And this is esteemed the best Way to dry Hops; which is the most hazardous Piece of Work that belongs to them. This done, you must lay them in some Room for three Weeks or a Month, that they may cool, *give*, and grow tough; for if bagg'd from the Kiln, they will crumble to Powder; but if they lie close cover'd with Blankets, you may pack or bagg them with greater Security.

The manner of Bagging of Hops is thus: Make a Hole in an upper Floor, big enough that a Man may with Ease go up and down, and turn and wind in it; then tack on a Hoop about the Mouth of the Bag fast with Pack-thread, that it may bear the Weight of the Hops when full, and of the Man that treads them; then let the Bag down through the Hole, and the Hoop will rest above, and keep the Bag from sliding wholly through; into which Bag cast a few Hops, and before you go in to tread, tie at each lower Corner of the Bag an Handful of Hops with a Piece of Packthread to make a Tassel by which you may conveniently lift or remove the Bag when it is full; then go into the Bag and tread the Hops on every Side, another casting them in as fast as you require it, till it be full. When it is well trodden and filled, let down the Bag, by unripping the Hoop; and close the Mouth of the Bag, filling the two upper Corners as you did the two lower. The Bags well dry'd and pack'd, may be preserv'd in a dry Place divers Years, if the Mice spoil them not.

This done, return to the Hop-Garden, and preserve the Hop-Poles for another Year: Strip the Hawm clean from them, and set three Poles triangular, spreading at Bottom, and tied almost at Top. Against these you may set all the Hop-Poles; bind them about with a little Hawm twisted. Thus the outward Poles are only subject to the Injuries of the Weather, except the Tops. There are Variety of Ways to preserve the Poles; but the best is, when they are thorough dry, to lay them up in a dry House.

In the Winter you must provide Manure for the Hop-Garden against the Spring. If your Dung be rotten, then mix it well with two or three Parts of untried Earth, and let it lie till the Spring: This will serve to make up the Hills with. If the Dung be new, then when mixed let it lie another Year; for new Dung is injurious to Hops. Horse-Dung and Cow-Dung are very good; but none can compare with Pidgeons-Dung, if a little only be well mixt in a Hill, that it may not be too strong in any one Place: Sheeps-Dung also is very good. In Spring, or Summer, if you steep the Dung of Sheep, Pidgeons or Hens in Water, till quite dissolved; and when you water your Hops, if you put a Dishful of this dissolved Dung among the Water you water your Hops with, in the hollow Places made to contain the Water on the Top of every Hill, the Virtue will be carried to the Roots of the Hop, and it may prove the most expeditious, advantageous and least expensive Way of enriching the Hop-Hills, of any other. Thus you may convey to the Roots of any Vegetable the inherent or attracted Virtue in Lime, Ashes, or any other fertilizing Subject.

Hops were first brought from *Flanders* into *England*, Anno 1524, in the 15th Year of King *Henry VIII.* before which, Alehoof, Wormwood, &c. was generally used for the Preservation of Drink. Very great Improvements have been made by Hop-Gardens in

the *West* of *England*, but especially in *Kent*. At *Farnham* in *Hampshire*, *Maid-stone*, &c. the Planters thereabout dig and dung the Hop-Garden about *Christmas*, and some time after they raise many Hillocks in Rows, about a Yard distant from each other: The Plants are set about *March*, and then are fix'd into each Hillock three Poles about eight Foot long; but at three Years Growth they set Poles of twelve or sixteen Foot long, according to the Strength of the Ground and the Hops. They are carefully dug and dress'd, and gather'd about the Beginning of *September*; after which, being thoroughly dried over a Kiln, they are bagg'd and sent to *London*.

The Expence of Digging and Dressing is about 3*l.* an Acre, (but all Expences a great deal more, perhaps thrice as much,) which may probably yield half a Load of Hops one Year with another; which, according to the Price in many Years, may be valued at 100*l.*

With taking the Pains that is necessary, (and which is every thing,) it has been computed that one or two Acres of Hop-Ground will yield more Profit than fifty Acres of Arable Land; but yet great Allowances must be made for the Disappointments of bad Years, and the Damage sustained sometimes even in the gathering and curing them. However, (as Mr. *Switzer* rightly observes) the Culture of Hops is in the main one of the most profitable Employments the Husbandman or Gardener can engage in. And the large Estates acquir'd of late by Merchandize in Hops, is a sufficient Encouragement for others to study to improve and cultivate this useful Plant. Besides, it is a Manufacture that employs abundance of Hands, and the Poor find Work and Wages almost all the Year, from the necessary Attendance of Planting, Soiling, Digging, Houghing, Poling, Tying and Picking. So that it is as well a publick Good, as of private Advantage.

The noble Plantations of Hops at *Farnham*, where for Regularity and Exactness they appear like Woods and Groves cut into Vistas, is a beautiful Sight; and it is not uncommon for those who are assiduous and skilful, to make of their Hop-Grounds some Years at least 30*l.* per Acre, even in large Quantities. But, as I said, Deductions must be made for bad Years; which commonly happen in the Proportion of one bad one for three good ones.

Anniseed will ripen well in *England*, if sown at *Michaelmas*, in well prepared Ground, and may turn to good Account to the Farmer: As also *Caraway* and *Coriander*. The first will last three or four Years, if the Ground be kept clean; but it is not fit to cut till the second Year. There is a constant Demand for them all; which the Farmer ought to remember.

Of M A L T.

MALT may be made of all sorts of Grain. In the *North*, *Big* is much used; but generally it is made of *Barley*, which ought to be of the best sort. This Barley is put into the Cistern, and covered with Water; rather from the Brook than the Spring; and there it lies till the Husk will rise or shell a little from it, which it will do after three or four Nights; then the Water is drawn off, and you are to let it lie eight, ten or twelve Hours to drain. It is best to let it have rather *too little* than *too much* Water.

When well drain'd, it is thrown, from six or eight Inches thick to a Heap, on the Couch Floor, according to the Weather; and it is stirred with the broad catling Shovel once, twice or thrice, or oftener in a Day. After Couching some Days, it will sweat a little, and begin to shew the *Sprit* or *Spire* at the Root-end; and in four or five Days more, it will become long; but, except the Weather grow very cold, it must be laid thinner, and stirred over three or four Times in a Day; but this differs greatly according to the Weather, and it must be minded accordingly; and the *Sprit* must seldom run farther than half an Inch. Besides the *Sprit*, there is an *Acrospire* that grows slowly under the Skin unseen, and the Corn malts no farther than it runs through the Husk; for it carries the Heart of the Corn with it; wherefore it is observed that a Maltster must take great Pains, and have his Wits about him, or he may be soon undone.

The Malt being made, and having lain its usual Time in the Floor, (which is about Three Weeks in the Winter, and less Time in the Summer) it is laid on the Kiln to dry, something thicker than it generally lay on the withering Floor; where, when it has lain about five Hours, with a constant regular Fire under it, the *first* Turn is given it; about four Hours after that the *second* Turning, and three Hours after that the *third*; and if the Kiln dry well, in three Hours more, with a moderate Fire, it will be dried enough. The Goodness of the Kiln, and the Greenness of the Malt, makes it sometimes more and sometimes less Hours in Drying. At *Derby* they have a Brick Kiln, which will dry more

in four Hours than was usually done in twelve Hours. There is great Art in Turning the Malt on the Kiln; and the common Way is to lay all the Malt on an Heap in the Middle; and the Hair-Cloth being laid even, this Heap is cast round, and the Place where it lay left quite bare, least any Corn sticking should be Fire-fanged. Then the bare Place is fill'd from the Sides; and so being raked very even, it is left.

The Malt, when dried, is removed from the Kiln (being thrown on a Heap in the Side next the Granary for that Purpose) and laid above a Foot thick, and trod round three or four Times, beginning at the Outside, and winding to the Middle of the Heap, and so back. This is call'd a Course; and in two or three such Courses, if well dried, the Malt will be trod enough; that is, all the *Come* will be rubb'd off; and if the Malt be to be kept long, it is thrown on a Heap in the Dust; but if it be to be sold in two or three Months, the Dust is immediately separated, by running it through a Fan or Skreen, that it may take the Air better in the Heap, and become more mellow, at the same time it is cleaned. *N. B.* This Method of Treading is not always used.

There are Brick and Stone Kilns for the Drying of Malt: And all the Floors for the Working of Malt are made of Plaister, which are much better than those of Mud, Lime or Boards; but Boards, I take it, make the best Flooring of the Granary for the dried Malt.

Some think 'tis best to grind Malt Four or Five Days before 'tis brewed, (but that is much controverted;) and some Persons would have it double that Time, and the Water Five or Six Days in the Vessel before used. There is hardly a County where there is not some good Beer and Ale made; but *Derby, Nottingham, Dorset, Burton, &c.* are most esteem'd. Indeed all the *Northern* Counties much exceed those of the *South*.

Malt, if it be burnt, is not only of a brown reddish Colour, and smells of Fire; but also yields very little Quantity of Liquor, and that with a high Colour and ill Taste; which generally, if not always, go together.

There are several Methods and divers Materials used for the Drying of Malt. In *Hampshire*, 'tis generally dried with Wood or clear Billets; which at best gives the Malt an ill Taste, and therefore is generally esteemed the worst Way. Another and the most common Way is, to dry it with Wheat or Rye Straw; which, if carefully chosen and used, doth very well and gives general Satisfaction. But the drying with Cowks has of late Years obtained the most universal Approbation, as having the least Smoke, and consequently leaving no ill Smell or Taste, except it be over-heated or burnt. Only some, who are not used to it, complain it makes the Drink *beady*, and leaves a *Clamminess* in the Mouth. There have been some Contrivances of late of drying Malt with red hot Iron Furnaces; but if the Weather and Season of the Year would countenance the Practice, the drying it in the *Sun* seems best and most rational, *that* being the purest and cleanest Fire. And it hath accordingly been practised in small Quantities by a Clergyman in *Northamptonshire* with great Success; from whom we have been made to hope and expect a learned Treatise on the Subject. As to the Complexion of Malt, *White* is undoubtedly the best, because most *natural*; for in all Preparations and Operations all Endeavours should be used to maintain the *natural* Complexion of the Thing; for the Tinctures arise and proceed from the fine Spirits and essential Virtues: Wherefore in the Order of making Malt, if the Colour be altered its Virtues also are changed, and the Drink is made of another Nature and Operation, and often proves injurious to the Bodies of Mankind; from whence we may certainly conclude, that the *whiter* the Drink is, the better and more healthful, as having milder and gentler Operations.

I think it is universally agreed, that the less Smoke there is in the drying of Malt, the better; because every degree of Smoke gives a Taste by no means agreeable to the Palate, except of such Rullicks, who swallow it down almost without Tasting, and judge of the Goodness of Drink by the Deepness of the Colour, and its intoxicating Effects. Wherefore for the Sake of such, common Brewers are wont to heighten both by *Scorching* the Malt, and *Lanting* the Drink in working, *i. e.* throwing in now and then a Chamber-Pot while it is working.

But, (except with such polluted Palates as these) the Art both of Malting and Brewing is at present brought to great Perfection in *England*, chiefly in the *Northern* Parts; and *English* Beer and Ale are earnestly sought for and greatly admired in all Parts of the World. It is plain *Northern* Barley, if it is as good, cannot be better nor exceed that of the *South*; and therefore the Excellence of our Malt and Drink must be owing to the Method of making and drying the Malt without Smoke, by means of Cinders or Cowks made of Sea or Pit-Coals. For there are Brewers and Waters of all kinds both in the *North* and *South*.

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London, and all the Parts about it for Thirty or Forty Miles round have been a long time infamous for the worst Drink, and famous for the best Bread: And all on the *North* Side the *Trent* just *vice versa*. But of late Years, Wisdom and Experience have taught both the *North* and *South* to mend their Errors, and to learn of one another; so that we begin to taste good Drink in the *South*, and as good Bread in the *North*. But to return to the Business of Malting.

Some of late have covered their Kilns over with Wire instead of Hair-Cloth, which is a Way much to be preferred: For this doth not only dry it sooner, but doth it much cleaner and sweeter. By means of this Grate, the unfavoury Properties and Particles of the Fire pass away more freely, and the refreshing Sweetness of the Air is not so much hindered from circulating, and consequently less Humidity is contracted: Whereas the Cloths are thick, and retain the Sulphureous Vapours which are so injurious to the Malt. This is manifest in all such close Places, where Stoves are; the Air having no free Circulation, becomes very noxious and unwholesome.

It hath been generally thought (as I have already observed) that to make the *best*, the *strongest* and the *most* Drink, the Malt should be ground Two or Three, nay some say Seven or Eight Days before it is brewed, to *mellow* it, and make the hot Liquor penetrate all the Parts of it. But as that seems to be a Reason of no weight; so others think, that the Injury which the Malt suffers by standing *ground*, is too great to suffer a bad Custom to continue. The outward Coat of the Malt is its natural Covering, to retain the fine spiritous Parts and inward Powers not perceptible to the Sight; therefore if by an undue Order or violent Method they are let loose, these spiritous Qualities, according to the Degrees of the Injury done, will evaporate invisibly; and then the Body, be it what it will, becomes sick, and by degrees will languish and die. The Case is the very same with Beer or Ale warmed at the Fire to make it brisk and sparkling; which yet, after it is *set* by two or three Hours, will lose its Spirits and lively Qualities, without having lost any of its Measure.

The like is to be understood of all other Things that have passed thro' any Digestion and Fermentation, as Malt hath, whose Body is thoroughly opened. Therefore if it be *ground* long before it is used, it is thought, by this way of Reasoning, the spiritous Parts and best Virtues will evaporate. But still a nice Observation and long Experience must determine this Dispute; one side whereof seems, as above, to be supported by good Reason and Philosophy.

It seems to be agreed by all, that grinding Malt too fine is a great Fault, and yet to be supported chiefly by the Reasoning above, that the Spirits of the Malt evaporate; neither will the Drink be so clear. The modern Contrivance of, not *cutting* but only, *squeezing* and *bruising* the Malt between two Cylinders (if the Skins of every Corn were sure to be broken) seems right and rational. But the Brewing of Malt, without either grinding or bruising, can be rationally practised but once, except a greater regard be had to a Daintiness for the Hogs, than to the Strength and Goodness of the Drink.

Of CATTLE, such especially as are most useful and profitable to the Farmer.

EVERY one knows the Usefulness of *Horses* and *Oxen* for the Husbandman and Grazier's Purposes; and the Choice of them being generally so much better understood by Practice and Experience, than by any Directions that Theory-men can possibly give, I shall think my self entirely excused saying any thing further on this Head, than just what I shall think necessary to introduce some Particularities and short Notices that have happen'd to fall in my Way.

As to *Horses* in the Use of Husbandry, and to make Profit and Gain of them, I cannot but recommend the Practice of many Places in *Northamptonshire*, where they buy them in Colts at Spring from *Leicester* or *Nottingham* (the great breeding Countries) at two and three Years old, teaching them to *bang* in the Geers, and using them for the more gentle Works, and less severe Service for a Year or two, and then sell them out again at the Fairs at *Northampton* for the Use of Gentlemens Coaches for Twenty Pound and Thirty Pound, and sometimes Forty Pound, according to their Goodness. And this is their yearly Practice, with respect to both Geldings and *Steeple-Horses*: By which the Husbandman, if he be wary and careful in his Choice, makes a very considerable Gain. But there is Discretion and Judgment to be used in every thing. They use them, as I said, *gently*; and tho' perhaps in *Harvest* and *Seed-time* and *Fallowing*, they are always doing *something*; yet

yet the discreet Husbandman so contrives it, that these *young Ones* shall rather *play* than *work*, having always two or three Drudges and Slaves (perhaps Blind or Old) on which the Burden and Chief of the Work must lie.

The greatest Misfortune that attends these heavy Horses bred up for the Coach is, that they sometimes, too often, fall *blind* of one or both Eyes, either in the Farmer's or the Gentleman's Hands, at three or four, or five Years old; seldom later. The Reason of which, some attribute to the high and hot feeding on Beans, Pease, &c. But those who are more experienced seem to think the Misfortune is to be ascribed to *blind* Mares and *blind* Stallions, so frequently kept for the Purpose of Breeding; that Weakness and Defect being very easily to be supposed transferrable to their Off-spring. Which hath frequently made the Farmers wish (and with reason too) that an Act of Parliament was made against keeping blind Mares and Stallions for Breed.

Oxen are no less useful to the Farmer for his Draught; and there are some peculiar Advantages attending *them*, more than Horses. They are easier kept. And if they prove either lame, or old, or blind, by Working, there is little or no Loss in them: For they will then feed as well, and afford as good Meat as a young one. Their Harness and Shoes are cheaper, as well as their Feed, because they eat no Oats: Neither are they subject to so many Diseases as Horses are; tho' heating them, and putting them beyond their ordinary Pace, sometimes puts them into Surfeits and other Distempers.

The usual Time of putting Oxen to work is at three Years old. The first Year they should be gently used, especially in hot Weather: And then their Meat should be good Hay, which makes them endure Labour better than Grass, that makes them faint and foggy. Used with Discretion, they will continue to work till they are Ten Years old. And then it may be advisable either to sell them, or fat them with the After-Marsh till *Christmas*. The best way to rear up young Oxen for the Yoke, is to couple them with old ones that are gentle and well-trained: And if they are unruly (as sometimes they will be) they should be kept hungry, and used to eat Hay out of your Hand. Gentle Usage with these slow and dull Creatures is best; for *that* is observed to bring them to the Yoke better than even *repeated Severities*.

The Use and Profit of a Cow to a Farmer is so considerable, that no Pains or Charge can well be too great for the procuring a good Breed. For which purpose a well-shaped Bull should be chosen. Those that are curious say, he should have a broad and curled Forehead, long Horns, fleshy Neck, and his Belly long and large. But of late Years, and especially in the *North*, the *Dutch-Breed* is much sought after and covered, which have *short Horns* and *long Necks*; and they are purchased at very dear Rates. Some for Fancy (which also much governs the Price of Horses) will give Twenty Pounds for a Cow of this Breed; seeing, as they imagine, such Beauties and Excellencies in them, that they cannot be bought too dear. But this is not, at least ought not, to be the Rule and Method of the Farmer, who is to value and purchase Things for their real Worth and Use. And, I confess, I could never yet see that these Kinds turn to more Profit, than our *English* Kinds when they are well chosen. Beside, there is one thing further, which (as I have been told by a very skilful Farmer) very much depreciates this Kind, and lessens its Value; and that is, that the Tanner will not give near so much in Proportion for their Hides; because they are much thinner and lighter. So that upon the whole, I can see no reason why a Farmer should purchase imaginary Beauty at a dear Rate; or to set it in the Language of the Proverb, why he should *go further to fare worse*.

The Cow is usually less than the Bull of the same Kind; but there are of all Sizes, and so fit for all Pastures; and amongst them a great many small ones, which are hardly worth their Keeping: But the Encouragement is, the many pernicious Commons we have, which for the Flush of Milk in a few Summer Months, makes the Poor buy Cows to starve them in Winter, and to spend so much Time in running after them, as would earn twice the Worth of their Milk by an ordinary Labour; whereas, if the Commons were inclosed, some would feed them well all the Summer, and others would yield Hay for them in the Winter; whereby there would be always a tolerable Plenty of Milk, from which would spring many more considerable Dairies.

Cows are sometimes used to the Yoke; and I have been told, that in some Parts of *France* they are ploughed with, and in *Barbadoes* Coaches are drawn with them. Some Cows are kept only for Nurses, as in *Lancashire*, and in some Parts of *Essex*, and wherever fattening of Calves is a Trade. It is a Practice for Graziers near *London*, to go into the Country, and give four, five or six Pounds for a Cow with Calf within two or three Months of Calving, and to sell off the Calves at one or two Days old, for Seven or Ten

Shillings each, to such Persons as make a Trade of fattening them; then they keep the Cows so long as they will give Plenty of Milk; but when that ceases, they fatten and sell them off.

Most Countries, if they will, and have good store of Feed for them, may have Plenty of Cattle; for most Cows, if kept so long, have a Calf a Year, from three to twelve Years old, sometimes more; so that here is a Possibility of encreasing Eight or Nine for One: And supposing only three or four Females, how many they will amount to in a few Years, must be left to Arithmeticians. Some Cows have often two or three Calves at a time; for at *Stapleford*, near *Epping*, in *Essex*, a Yeoman had a Cow which brought at one Time three Calves, which were sold to the Butchers for Nine Pounds.

And Dr. Plot, in his *History of Staffordshire*, tells us, that a Person living at *Dunstal* in that County, had a Cow that brought three times together two Calves at a Time, and the third Time three Calves; so that she had Nine Calves in three Years time: And that another Dairyman of *Wombourn* had a Heifer that at two Years old brought him three Calves, then two, then two more, and at last three again, having Ten Calves in the same Time. He also tells us of a Cow-Calf at *Cannal*, that had a Calf three Weeks and some odd Days before she was twelve Months old; and of another at *Wolverhampton*, a Fortnight before a Twelvemonth old. The chief Use that Cows are kept for, is their Milk.

The Calf, whilst alive, is of no manner of Use; but when killed, is profitable. The Manner of Fattening them, is generally pretty well understood. I am inform'd that there come from *Rumford* in *Essex* to *London*, weekly, several Carts or Waggon, bringing one with another, about twenty Calves each: These Calves are brought from great Distances round *Rumford*, and a great many of them from *Suffolk*; I think I have heard from *Norfolk*.

Besides these, are brought from *Malden*, and other Places in *Essex*, near the Water, a great many each Week. From Places between *Rumford* and *London*, Calves are brought to Town on Horseback, and here sell for Two, Three, Four, or Five Shillings each, more than those brought in Carts from *Rumford*; and the Reason is, because they do not waste as the others do. Calves are often sold alive for between Three and Four Pounds a-piece.

In *London*, when Calves are kill'd, the Butchers blow them; and some, when flay'd, lay them whole in Water, or wet Clothes, for several Hours, or whole Nights: The Blowing makes them look fair and large; the Watering white.

Without *Aldgate* there are said to be fifteen Butchers, every one of which kills, one with another, Two Hundred Head of small Cattle weekly, viz. Calves, Sheep, and Hogs, which amounts to upwards of One Hundred and Fifty Thousand in the Year: And there are six Butchers that kill each six Beeves a Week, which is Thirty Six, and Eighteen Hundred Seventy Two the Year. And it has been computed, that in the City of *London*, upwards of One Hundred Thousand Beeves, as many Calves, and Six Hundred Thousand Muttons, are killed and consumed in a Year.

In *Lancashire*, the Manner of Breeding of Cattle, is by turning two Calves to run or suck upon one old Cow, from about the Beginning of *April* until the End of *August*; and it is a good Way for Calves to suck so long; but where there is one brought up so, there are five brought up by Hand. Suppose a Calf to drop in *January*, *February*, or *March*, or later in the Year; when the Calf is a Week or Ten Days old, they wean it from its Dam, and teach it to drink by putting the Finger into the Calf's Mouth, and with the other Hand thrusting his Head down into the Pail, and then the Calf clasps his Tongue about the Finger as if he would suck, and so fetches up the Milk; and after a few times thus doing, the Calf will drink on his own accord with great Greediness: Which at first is good new warm Milk from the Cow, until the Calf be about a Month old; and then they mix a little Pottage (made of Blue Milk, Skim Milk, and Oatmeal) with some of the New Milk, and give it the Calf Blood-warm; and as the Calf grows older and larger, they give it more of the Pottage, and less New Milk.

Now this Way of Pottage is used most by those that have but a few Cows, as two, three, or four at a House; or by those which have more, as ten, twenty, thirty, &c. who keep a Dairy; but their Calves drop in Winter, before they make Cheese, and so have no Whey to give them: Otherwise, if the Calf be six Weeks or two Months old when they begin to make Cheese, they give the Calf Morning and Evening a little Pail-full, containing about five or six Quarts, of good sweet Whey, instead of the Pottage and Milk. And this Way of Drinking, (whatsoever the Mixture be, for some make it one Way and some another, and vary it at different Ages of the Calf) is continued until the

Calf

Calf be fourteen or sixteen Weeks old, as they see the Strength and Good-liking of the Calf; and then the Calf is weaned and treated with Grass in the Day, and good Hay, or Hay and Straw in the Night, as the *Runner* is treated.

The Reasons why they teach the Calves to drink so soon, are various: *First*, If they suffer the Calf to suck too long on its own Dam, she will not give her Milk so well after they are separated for many Days, she will mourn so much for the Loss of her little One. *Secondly*, The Goodwife saves Milk by this Way of Drinking. *Thirdly*, The Persons that would rear Calves, have no old Cows to turn Calves upon; and as some poor People have but two or three Cows, yet those can rear two, three, or four Calves if they please, (for they commonly buy a fine Calf of a Neighbour of a Week or Ten Days old, and rear it, and prevent the Butcher of having it for Slaughter,) and so proportionably to the Cows, they may rear what Number of Calves they please: Some Persons will rear above Twenty Calves on one Farm in a Year. *Fourthly*, By teaching the Calf to drink, they have not only the Cow ready for the Dairy, but she is also fit for Bull in a convenient Time, (which is a chief and principal Thing in a Dairy,) and so they have the Service of the Cow again the next Year, which they cannot have of that Cow on which two Calves suck till *Michaelmas*: And these Calves at a Year, or two Years old, are treated like other finer Breed.

As to the Use of the *External Parts* of Kine, the Horn is useful to many Purposes; as, to make Lanthorns, Hafts for Knives, Combs, &c. They make Walls, the hollow Spaces between them being fill'd up with Mud and Dirt; laid under-ground, they keep it hollow, where Draining is necessary; and a third Use of Horns is for improving of Land, if broke in small Pieces, or burnt and strewed upon it; for then it very much imbibes the Nitre of the Air, and so fertilizes the Ground.

Horn-Shavings are sold for Eight Shillings and Six-pence the Quarter Sack; and five Sacks, if strewed on cold stiff Ground, or scattered in Furrows before the Plough at *Michaelmas*, will very much improve two Acres of Land, but do little or no good to hot Ground. A Person inform'd me, that when he was a Boy, (and he is since upwards of Sixty Years old) he knew a wet cold Place of six or seven Acres of Land, that had sixteen Sacks of these Shavings strewed upon it, and it brought Corn plentifully for four Years together; and then being laid, it brought forth very good Grass, and continues so still. The Saw-Dust of Horn mixt with Mould, is an excellent Compost for the raising of Flowers.

Hair of Kine will produce Oil, Spirit, and all Things that Horn will for Uses physical; and by reason of its Thinness, it fertilizes Land sooner than Horn, unless finely raspt. It is also good to keep Mortar together for Walls; and by Spinning and Weaving, it makes Cords and Cloths.

The Hoof is of the Nature of Hair and Horn, both for physical Uses, and Improvement of Land; but the Hoofs are chop'd into small Pieces, and sow'd on dry Ground, which makes it very fruitful for three Years; and so again, if repeated. This Custom, with Horn, Hair, Hoofs, and Rags, reaches several Places, and much to their Advantage.

The Hoofs are sold from Twelve to Eighteen Pence the Bushel, and are often set on Sticks in Gardens to catch Earwigs, where they are of great Use to the Florist.

Having said thus much about Cows, and given some Directions to the Farmer for chusing and managing them; he will, I hope, now excuse me, if I say something of the Nature of Milk, tho' it be in a more physical and philosophical Manner.

Of MILK.

MILK is a refined Liquor, free from divers gross Parts, and sent forth from the Blood in the Breasts or Udder; where, by Means of its oily, waterish, and saline Parts, and a great Working or Straining through many Passages, it is reduced to a Whiteness; and sometimes by an over-great Plenty, or Weakness of the Teats, runs forth, and at other times is emptied by sucking or pressing the Parts; which causing a kind of *Vacuum*, it is supplied again by the Pressure of the Air.

This Milk (in Beasts) is composed of Butter, Curd, and Whey; and they have not only an Alkalizate, but an Acid Salt, as it is seen at first by Milk turning with an Acid, and by its own Acid it is exalted. It is the Food that Nature provides for the Support of the Young; and indeed it is well adapted to that Purpose; for by its Warmth when suck'd,

suck'd, it comforts; by its Oiliness, it enables the Parts to be extended; and it greatly adds to Nourishment: By its *Caseous* Parts, it adds to the Solidity; and by its *Serous* Parts, it serves as a River to carry the rest. It cools and furnishes Matter for all watery Evacuations.

If it be thus with Young, why should it not agree with Elder Ages? It is a Maxim, *Quo res acquiruntur retinentur*; *Things are maintained by the Ways they are attained*. But I must confess, when Men are grown up, it may be very convenient to have more solid Food; and the reason of it I take to be, because Milk must be taken in great Quantity, and by reason of its Thinness it spends quickly, and the Man wants a Supply sooner; and if he labours hard, he may spend his finer Parts, and the other may coagulate the Milk the sooner: Therefore Flesh, Butter or Cheese, which are made of Milk, and are their chief Parts contracted into a greater Closeness, and much more portable, and that will keep longer when dress'd, may be more proper for him: And the reason why one Meal a Day serves many Men, is because it is Milk, Juice of Plants, or other moist Meats contracted, and expanded again with Water or other Liquors; and commonly such Men use not Labour or other Exercise to spend themselves, so much as great and painful Workers, who are obliged to eat often in a Day; for according to the Expence must be the Supply, or else we waste our Flesh, and reduce our selves to Leanness.

But a great many complain of Milk, and say it is phlegmatick and stopping, and consequently not so wholesome for Men to eat: Tho' this I take to proceed from much Wine and Drink, salt Meats and sour Sauces, which many Persons are fond of, and which debauch the Stomach, and cause so much Acidity there, as will turn the Milk over-hastily, and make it into thick and hard Curds; even so thick, it is vomitted up as it were in long Ropes. The like may be said of some emaciated People. But this is not the Fault of the *Milk*, but of deprav'd Stomachs; and if they would leave their ill Habits, and accustom themselves to this by little and little at a Time, it will by degrees destroy the Acid, bring all to a good Temper first, and then nourish and fatten.

By being *Phlegmatick*, I suppose is commonly meant, that it is viscous, sticking together like Phlegm or Spittle; and when *Milk* is drunk raw from the Cow especially, there will be often some such like spit up; but these do not consider that it goes not thus into the Blood; it is curdled and separated, the thick from the thin, before it comes there, and so it cannot stop the Vessels any more than solid Food can. In short,

Milk, used with Discretion, is *Meat*, *Drink* and *Medicine*: It is so agreeable to Animal Temperaments, that in all likelihood the great Use of it was one Cause of the Longevity of the *Patriarchs*; and we generally find, that where it is most in Use, there are fewest Diseases and Physicians.

It is dress'd various Ways. It is thicken'd with Flower, Oatmeal, *French* Barley, Rice, Eggs, &c. and of late with *Sago*, which is said to be the Peth of the Palm-Tree brought from the *East-Indies*, and used as a great Restorative. As for Physick, it is used in as many Cases: Inwardly, it often cures Consumptions, and several other wasting Distempers; especially the Milk of the *Ass*, which is found by Experience not to curdle in the Stomach; nay, will not turn to Curd, tho' you pour Vinegar on it while it is warm. Outwardly, Milk is very good for sore Eyes; in Cataplasms it will ripen and break hard Swellings in the Throat, or several other Parts, if made with Flower, Oatmeal, &c. From the ingenious Mr. *Evelyn*, I have heard it commended for a great Easer of the Gout, if enough be warm'd, and the Legs set up to the Knees in it, and continued there till warm. Milk and Water is a common Wash for the Face, and a common Drinking in the Summer Season. It is greatly used with *Coffee*, *Tea* and *Chocolate*, and by the Vintners in their Wines; and is one of the most universal Sustenance Mankind knows.

Some have a great esteem for *Water* distill'd from *Milk*, either of itself, or with several other Ingredients; and this is commonly or constantly done in Alembicks, or a common Still: But, besides what rises from the Ingredients, I can see no Advantage more than if it were distill'd from fair Water; for *Milk* is an Animal Matter, and nothing will arise from thence but the watry Parts of the *Flegm* or *Serum*: Neither will the Oil from the Buttery Part of the Milk, nor the Earth or Salt from the Cheesy Parts arise in such Heats; of which I am well satisfied from the Nature of it as to its Animal Substance.

Of BUTTER.

AT *Over*, near *Cambridge*, they keep a middling sort of Cows, sell many off at *Michaelmas*, and buy others that will Calve each Month of the Winter, that they may have Butter enough to serve the Colleges; and by Hay-feeding, they have almost as much Butter in Winter as in Summer; and as Sweet and as Yellow (for New Milch Cows make Yellow Butter) as usually others have in *April*; and the Butter of this Town is commonly sold for at least a Half-penny the Pound more than other Towns sell for, and the Curious always enquire for *Over-Butter*.

In *April*, when the Cows go first to Grass, about Twelve Quarts a Day, *Winchester* Measure, is good Milking for a New Milch Cow; and this, if well skim'd, yields about a sixth Part or Four Pints of Cream, which will make almost Two Pounds of Butter. They Churn twice or thrice in a Week, pouring the Cream from the settled Milk into a clean Earthen Pot every Morning; which keeps it from sowering, and makes it the best Butter, tho' not so much: And this Cream they put in the Churn about Sun-rising, after they have milked the Cows.

In a great Dairy they sometimes put into a Churn, about the Bigness of a Barrel, Two and Twenty Gallons of Cream, which fills two Thirds: This, with the Labour of a lusty Man and Maid, comes to Butter in about an Hours time, more or less; in hot Weather 'tis soonest, in cold Weather 'tis longest; but if the Cold be mended much by Fire, it changes the Butter in Taste, Colour and Stiffness; but to be in a Room a Yard and a half distant from the Fire does well; and in very cold Weather they put boiling Water in the Churn till it thoroughly heats it, and that being taken out they put in the Cream. These Twenty Two Gallons, or One Hundred and Seventy Six Pounds of Cream, yield usually about Seventy Pounds of Butter; which is about Seven Parts in Eighteen.

Some Persons Churn by the help of a Sweep, which is a Thing like a Pump; others use Barrel-Churns, and reckon them best. One that keeps Sixty Cows in *Denny*, a Town not far from *Over*, has a Barrel-Churn that holds a Hoghead, and is called a Hoghead-Churn.

When the Butter is come, it is taken out and wash'd, if for present Use, otherwise not; and with a little fleeting Dish, it is drawn backwards and forwards in a Bowl, a little at a time, to let out the Butter-Milk, and then it is salted: A Quart of Salt, which is about the Fifteenth Part, will serve Thirty Pounds of Butter, but some put more or less; and when salted, it is drawn over again with a fleeting Dish once or twice; then weighed into Pounds, and rolled into long Rolls; when in hot Weather, it is put into a Basket and hung all Night in a Well, within a Yard or a Yard and a half of the Water, to make it stiff; and in these long Rolls it is carried to Market, and cut out and sold chiefly for the Use of the Colleges.

The *Over* Butter will not keep so long as the *Suffolk* Butter; but a famous Dairy-Woman that lived there, used to make her Butter in Balls of Thirty or Forty Pounds Weight, and salt it a little more than for Fresh Butter, and this she laid in the Middle of a Bin of Flower, and it would keep all the Winter. Others salt it as usual, and put it into Pots, and cover it about two Inches high with good Brine; but this will not keep so well as the other.

The Butter-Milk is drank by some Persons, but the Dogs or Hogs have the Bulk of it; and if it stands long, it will turn sour, and in a Week's Time from five or six Quarts will arise a thick Skin or Top, as thick as one's Finger; and under it will be a very clear bluish Whey, and at Bottom a thick Curd, but not like Cheese-Curd. It is knotty and slippery. Of this Butter-Milk some poor People make Cheese, but it is very rough, and must be eaten while green or fresh: The Whey that comes from it is very thin, sour and green, and the Hogs care but little for it.

In *May*, *June* and *July*, (when the Dairy-Men chiefly make Cheese) they milk the Cows half, which they use for Butter: The other half or Stroakings they use for Cheese; and these Stroakings will yield most Butter and most Cheese, and least Butter-Milk or Whey.

In an indifferent Year, a good Cow will yield at this Time Sixteen or Eighteen Quarts in a Day; and if the Weather be dripping, she will yield more, and Butter is made longer. In *August*, and so to *April*, they must make Butter both to serve their Customers, and because in cold Weather Cheese will not be so good; otherwise Cheese turns to the best Account.

Sweet and new Cream will make very pleasant Butter for present spending ; but if the Cream stands till it is sour, the Butter will be good and keep longer, provided it be not over-heated in the Churn ; but if once it turns bitter, it is good to spend it presently, for it will soon decay.

At the Fall of the Leaf, and in cold Weather, Cream will turn from Sweet to Bitter, and the reason is generally said to be because the Cattle eat the Leaves of Trees ; but this has been contradicted, because it will be so in low Grounds where there are no Trees, as well as in Uplands, where there are Trees : And what is the real reason of it, is hard to know till we have a good Theory of Taste, which is difficult to be got, and greatly wanting. The best way to prevent this Bitterness, is to set the Milk a less Time, and Churn it oftner ; but this will produce but a small Quantity ; and it is best to sell and spend it new, and not to pack it in Firkins ; for it will not sell in *London*, but the Traders are forced to ship it off to other Countries, where, by its Badness, it disparages our own Products.

It is said, if Salt Butter be well washed, and then beaten up with New Milk, it will taste like Fresh Butter. There is commonly Four Shillings in the Hundred difference between *Suffolk* and *Northern* Butter, and sometimes more ; but it is not so much the fault of the Country as the Management : For if the Dairy People would be at the Pains to work it well, and get out the Butter-Milk, the Butter would be firm, and both well coloured and tasted, as it is in most Parts of the Bishoprick of *Durham*.

The *Irish* rot their Butter, and in hot Countries they *clarify* it ; the Taste of either of which pleases not those that do not imitate them. The chief Use of Butter is for Food ; and it is an excellent one, but of more Use in hot Countries and Weather than in cold : And in Medicine, Butter is good for all Things that Oil or Grease is. The *Dutch* Men say, it is good for every Thing but stopping of Ovens.

In *Devonshire* they make a *scalded Butter*, much admired at *London* of late, whither it is sent weekly, tho' at so great a Distance : For therein consists its great Excellence, that it will keep Three or Four Weeks, and eat altogether as well as Fresh Butter. The Method of making it, is, First, after the New Milk is strained into clean Earthen Pans, they let it stand for a Night, or Twelve Hours in the Day, removing it then very gently, and setting those Earthen Pans into another Vessel made of Earth or Lead half full of Water, which Vessel is fixed and set over Stoves with a gentle Fire ; by which means there arises a thick clouted Cream, which is taken off with a Scumming Dish of Tin full of Holes, thro' which the blue Milk passes and is separated from the Cream ; which Separation, when it is gradually and fully made, and the whole Cream put into the Pot, the Whole must be shifted every Twelve Hours till you have your sufficient Quantity ordered as above ; and then it must undergo the common way of *Churning* and *Salting* till it is made into compleat *Butter*.

In some Places they churn their Milk whilst it is new and warm, conveying it in Pipes from the Cow into the Churn, where it is kept in constant Motion by an Horse, till the Butter comes. Then they drain the Butter-Milk off into another Vessel, to which they put Runnet ; and of this they make excellent Cheese for a Family. But tho' the Butter is good for present Use, yet it will not keep long.

N. B. The Proportion of Milk for one New Milch Cow at *Over*, as afore said, was thought to be about Twelve Quarts a Day, and a large Quantity too ; but in *Northamptonshire*, the late Vicar of *Stanford upon Avon* told me himself, that he had a Cow (and no large one neither) going in his Church-yard, that yielded him, (not for One or Two Weeks only, but) for Two or Three Months, no less than Twelve Pounds of Butter every Week, and made tolerable Cheese for the Family with the Milk afterwards.

Of CHEESE.

THE Benefit and Advantage which Men and other Creatures receive by Milk, naturally prompted the Provident to lay up what they used not presentl; and its Use being universal, it was in Time cultivated and improved, and by Man's Invention rendered into *Cheese*. To tell all its Advantages, requires much Knowledge of others, and Experience of one's own: But the principal Aim being to make the oily Part of Milk the Butter, or the hard Part the Cheese, *keep*; it is found that the harder it is turned, the firmer is the Curd, to a certain Degree.

Therefore an Acid (sour Thing) must be put into it; as, the Flowers of Thistles, or Artichokes, or rather Chardons; but the Maw of a sucking Creature, Calf, or Kid, is most usual; which causes the Milk to turn to a digestible Consistence. Some use this Maw after it is dry, by snipping off a small Piece at a Time, and putting it in a little fair Water or Sack, for Twelve Hours before. Some pickle the Maw and dry it in the Smoke, and put the Cheese together while the Milk continues warm, or heat a Part and mingle it to warm the rest. Remember, the Maw itself must not go into the Milk. But as it is the Practice of the *Spaniards*, so it ought to be of the *English* too, to use the dried Flowers of *Chardons*; which, as it is the cleanliest, so it is by much the best for turning the Milk into Curd.

Then, when the Milk is curdled, the meer dividing makes the Whey separate, and the Curd sink down; which must be put into a Vessel, and thrust very close, and salted, and this to prevent Corruption, which requires *Running*, as all Change of Texture does; and the Salt dissolving, makes the Moisture so thin, as to run away; and when dry, it keeps all firm. Then the Cheese is gently press'd; and either sliced and scalded, which makes it curdle yet harder; or only crumbled, to open it and let out the Moisture: And then it is made up again, and pressed yet harder to make it close and even. Some ripen it in Dung, or green Herbs that will heat, or in Smoke that makes it soft, and fit for present Eating: Others keep it dry for many Years; and for *Duration* and *Nourishment*, no other Food equals it.

There are other Things which may be used for the turning of Milk into Curd, besides what are above-mentioned, *viz.* the Seed of *Carduus Benedictus*, Ginger, the Juice of the Fig-Tree, the inner Skin of a Hen's Stomach, the Spawn of a Pike, &c. But the dried Flowers of *Chardons* are best, steep'd over-Night in Water and Salt.

From Whey, if set on Fire, will arise Wild-Curds, by putting new Milk and four Butter-Milk to it. When it is ready to boil, and when it rises, the Curds must be taken off with a fleeting Dish or Skimmer, (but a Dish is best, because the other is Brass,) and then with putting in more Milk and Butter-Milk, more Curds will arise. Two Quarts of Milk and so much Butter-Milk, will serve for six Gallons of Whey. The Whey that is left when the Curds are taken off, is but a little better than the worst from Butter-Milk: But the good Butter-Milk and the best Whey will fatten Hogs well, though some think Butter-Milk doth Hogs no good.

An Account of *Cheshire Cheese*, as made at *Nantwich*, is as follows: The Ground to feed the Cows on, is very good, where it usually bears Plenty of Cowslips. The Cows are of a large Size, broad-headed, and horned, and in their Prime at six Years old. From the Milk of sixty such Cows, which yield about six Quarts each Meal, is the best Cheese made, after the following manner:

The Milk is strained into a Cheese-Tub, as warm as they can from the Cow; to which is put about six Spoonfuls of strong Renner, and it is stir'd well with a fleeting Dish, and afterwards cover'd close with a Wooden Cover, made fit for it; and about the Beginning of *June* it stands three Quarters of an Hour; but if very hot Weather, less Time, and then it will be *come*; after which it must be broke with a Dish pretty small, and then it must be stir'd, gently moving until it is all come to a Curd; then it must be press'd down with the Hands and Dish gently, lest the Whey should rise over white; and when all the Whey is drain'd, and the Curd pretty hard, then it must be broke into a *Vat* very small, and heaped up to the highest Pitch; and then press'd down with the Hands gently at first, afterwards harder, till as much Whey be got out as can be that way, and yet the Curd be at least two Inches above the Vat; otherwise the Cheese will not take Press, but be sour, and full of Holes or Eyes.

This done, it must be put into one End of a good Flaxen Cloth, and covered with the other End; and then the Cloth must be tuck'd in with a wooden Cheese-Knife, that it may lie smooth, and yet keep the Curd quite in: Then this is press'd with a Weight of
Four

Four Hundred or thereabouts; and let to stand thus from Morning about Nine till the Afternoon about Two a Clock, and then taken out, turn'd into a dry Cloth, and press'd again till about Six at Night; and then it is taken out, and salted well all over, and put into the Vat again to lie in it all Night: Then it is taken out, and salted again, and so it lies in a Tub or on a Dresser four Days; being turned every Day. This done, it is washed in cold Water, wiped with a dry Cloth, and carried into a Cheese-Loft to dry, where it must be turned and wiped every Day till sold.

If the Salt be not well washed off, it will *give*, and make the Cheese always moist: And the Reason of Mouldiness, Cracks, and Rottenness within, is the not well curing, *viz.* pressing and looking after. The way to make *Runnet*, is to take the Curd out of the Calf's Bag, to wash and pick it well from Hairs and Stones, and to season it well with Salt; also to wipe the Bag, and salt it well within and without, and putting in the Curd. All must lie in Salt for three or four Days, and then be hung up.

Here follows an Account of *Cheddar Cheese*: *Cheddar* being warmly seated on the South-side of *Mendip Hills* in *Somersetshire*, is exposed only to the South and South-west Winds; and has the Moors adjoining to it on the South, being a warm and fertile Soil for Pasturage, whereby *Cheddar* is rendered famous for Cheese; and it has been long a Custom there, as well as in some adjacent Parishes, for several Neighbours to join their Milk together, as occasion requires, to make the said Cheese; which is of a larger Size than ordinary, and contends in Goodness (if kept a due Time, *viz.* from Two Years to Five Years, according to its Magnitude) with any Cheese of *England*. The Sizes of the Cheeses are generally from Thirty Pounds Weight to One Hundred Pounds. And perhaps this Practice, when rightly considered, may deserve Imitation in many other Parts of *England*.

To make *Angelot-Cheese*, take the *Stroakings* of two or three Cows, and set it with *Rennet*, when it is newly milk'd; and then when it is come, take it up with a Skimming Dish without breaking the Curd; and then fill by degrees a narrow high Cheese-Mote or Vat, continually filling as the Curd sinks, till the Mote is full. If you would have the Angelot thick, the Mote or Vat should be Six, Eight, or Ten Inches deep, divided from Top to Bottom into two equal Semicircles full of Holes, which are exactly fitted into another flat Cheese-Vat below also full of Holes, all according to the Size you desire to have it. You must keep it continually filling for three or four Hours; then let it stand till Night, strewing a little Salt upon the End that is uppermost, and turn it by opening the Semicircles; and then salt the other End, and so let it remain nine or ten Days without removing, lest it should crack and break: After this, keep it in a temperate Place, that it may dry by degrees. The proper Season to make this excellent sort of *Angelot-Cheese*, is in the Beginning of *May*, or rather in *August*. If you would have it fatter, add a fourth Part of Cream.

If Cheese be not well salted, it will be maggoty; and an *equal* Salting is of great Advantage in the making of Cheese; for as *too little* causes Corruption of the Cheese, so *too much* alters its Goodness: And to lay Cheeses all in Brine, a longer or a shorter Time, according to their Magnitude, or the Temper of the Weather, has been by some approved the surest Way; but it is apt to make it strong.

If Milk be set over-hot, or scalded in the Curd, the Cheese will be *bitter*; and the longer it is kept, the worse it will be: If it be set over-cold, it will cut white, and eat harsh and dry when new, but it will improve by lying, and is best esteemed of for *keeping Cheese*. One great Fault in Cheese, is its heaving; and this is most common where there is the richest Pasture, and after Rain. The best Way to help it, is by pasturing Sheep with Cows, that the best of the Grass may be quickly eaten: Another Way to help it, is to salt the Cheeses in Brine, and lay them on a cold Pavement.

From the aforesaid Observations, it seems very reasonable that it does thus chiefly in hot Weather, by reason of an over-great Fermentation, not only from the Heat, but also from the Briskness and Thinness of the milky Particles gain'd from the Luxuriancy of the Grass; and without doubt, it is as convenient for Dairies to have cool Rooms in Summer, as warm ones in Winter. We see by Multitudes of Examples, that Beer and other Liquors, or any thing that is subject to Fermentation, never prove so kindly in extreme as in temperate Seasons. If any could find an Art to hinder the Buttery Part running into the Whey, it would be very acceptable to the Dairy-Maid.

There is yet another sort of *Cheese*, well known by good Housewives by the Name of *Water-Cheese*; which is made after the following manner:

Take six Gallons of new Morning's Milk, and one Gallon of Cream, mixt together with six Spoonfuls of *Rennet*, (made after the foregoing manner with *dry'd Skins*) and a little Juice of Marigolds. Stir these altogether, well covered down in a Cheese-Tub. Let it

it remain very hard in *coming* : Then take a wet Cloth wrung from boiling Water, to be spread upon the Curd all over without breaking it. Lay your Hands upon it, pressing it very gently ; which you must continue to do till you have gathered with a Dish all the *Whey* from it ; which, if it prove right, will be like Rock-Water. This done, put two Gallons of boiling Water on the Top of the Tub among the Curd, there to remain half an Hour. After which, take away again the same Water as clean as possible, which may be done by Cloths, and wringing them out. Then take a long Knife, and cut the Curd into so many Angles of the Circle, as that you may *turn* them without breaking, laying them in the same Places again with their Bottoms upwards. Then again pour one Gallon more of scalding Water upon the Curd, letting it remain half an Hour ; take the Water from it as before, cutting all the Curd into little thin Slices, laying the said Slices in a Cheese-Vat with a Cloth in Beds one by another, crushing every Row with the Hands till the Whole is laid in. Then press the Cheese thus made, and let it remain six Hours. After which, take it out and turn it, rubbing Salt on both Sides, and round the Edges. Put it again into the Cheese-Vat, and let it stand pressed all Night ; and then it may be taken out and turned daily, as other Cheeses, twice a Day upon Shelves.

It may not be amiss to mention likewise the Method of making the *wrinkle-coated* latter-made Cheeses, so universally admired by all the Lovers of Cheese, which yet so very few are acquainted withal. Two Gallons of new Milk will make two Cheeses of a proper Size ; and the Time of making them is in *August* and the Beginning of *September*, thus : To those two Gallons of new Milk put a proper Quantity of *Rennet*, or rather the Water in which Chardons have been steep'd, as before ; and after it is *come*, break the Curd and gather out the Whey with a Dish. Then laying a Cloth on a thin Cheese-Vat, put in the Curd with the Skimming Dish into each Cheese-Vat, not pressing it with the Hands ; but only when the Cloth is laid over it with a Board, lay about six or seven Pound Weight upon it for about four Hours : Then take it out, salt it and turn it, and put it in again for about six Hours more. After which take it out and lay it upon a Shelf, turning it twice a Day till it is ready to eat, which will be in about a Month.

But because there is a sort of Cheese of late Years become famous and much admired, as being really good in its kind, called *Stilton Cheese*, it may not be amiss to spread the Receipt how to make it a little farther than Mr. *Bradley's* Monthly Papers ; where he tells us, it was communicated to him by a Friend that may be depended on. I hope the Receipt is more accurate and just than the Description of the Place given us by Mr. *Bradley* : For *Stilton* is not in *Lincolnshire*, but a great Way off in *Huntingtonshire* ; neither doth it stand on *high Ground*, but on a *Flat and Level* near the Fens. However, here follows the Receipt to make the Cheese.

Take ten Gallons of Morning Milk, and five Gallons of sweet Cream, and beat them together : Then put in as much boiling Water as will make it warmer than Milk from the Cow. When this is done, put in Rennet made strong with large Mace, and when it is *come* (or the Milk is set in Curd) break it as small as you would do for Cheese-Cakes ; and after that salt it, and put it into the Vat, and press it for two Hours. Then boil the Whey, and when you have taken off the Curds, put the Cheese into the Whey, and let it stand half an Hour. Then put it in the Press, and when you take it out, bind it up for the first Fortnight in Linnen Rollers, and turn it upon Boards for the first Month twice a Day.

Good Cheese is fat and heavy, the Meat of it close and compact, of Colour somewhat yellowish, sweet to Taste, pleasant to Smell, and nothing Mouldy ; neither yet full of Mites or Worms, and which is made of pure Cows Milk.

Cheese, as I have already observed, is a Food most nourishing ; and the older (so as it be not decay'd) the better. We see that with Bread and Drink it supports the Laborious six Days in the Week ; and is of great Use for Armies. It is a Food that not only will keep, but may be carried good to most Parts of the World. In its Curd, or New, it is said to ease the Pains of the Gout ; and it is sometimes used in Poulis's to divers Purposes. And it may very well be added, that the oldest and strongest *Cheeshire* Cheese is excellent against Cholick Pains in the Stomach.

Of SHEEP.

SHEEP, wherewith this Kingdom abounds, producing the most excellent Mutton and the best Wool, there cannot be too great Care taken for their Preservation. And these are liable to bad Diseases, particularly the Rot; which is a sort of Dropsy, and distinguish'd into two sorts, the one call'd an *Ascites*, and the other an *Anasarca*.

An *Ascites* is, when the Belly of any living Creature is very much swell'd with Water, gotten out of the Vessels, Guts, Veins, Arteries, &c. An *Anasarca* is, when the whole Body is swelled with Water, gotten out every where; and when it is only in the Legs, or some other Places within the Flesh, it is a degree of this *Anasarca*; or, as Doctor *Willis* defines it, it is a white soft Tumour of the whole outward Body, or of some of its Parts, yielding to the Touch, and leaving a Dent upon Compression.

This Water, in both Diseases, is of the same Quality, viz. it is of the same Nature of the Urine, and Serum of the Blood; and, I presume, the Water gets out of the Vessels by some such Way as the following: The Vessels, as also the Skin and Bladder, are made as if it were of Threads fastened together, by which means there are abundance of Pores, which, in an healthful State, are tolerably filled up with the Serum of the Blood; altho' not so close, but that some of the thinnest Parts, according to the Degree of Heat, do transpire either insensibly or by Sweat, which with Warmth will thicken, leaving only the Threads of the Skins behind. When this thicken'd Matter is dissolv'd, either by a sharp Juice, and so the thick separated from the thin, as it is in Milk with the help of Renner; or an over-great Quantity of watery Matter is taken in, which washes away this gluish Substance, as we see it does in making Glue, Size or Gellies; or when Animals are almost starved, and so waste this Matter, which I take to be the thing that nourishes us; which is often the case of Sheep in time of Rot, with the addition of eating more cold watery Food than at other times, which Moisture washes away that glutinous Part that was left; it is no wonder if the Water soaks through the Pores of the Vessels, and so having no Passage to run away, causes that Swelling we call a Dropsy, and makes all the Flesh thus affected to be waterish and flabby.

Besides the Description of the two sorts of Dropsies above-mention'd that Sheep are subject to, there are some strange Symptoms of such Diseases; that is, such Sheep have often found in them a sort of broad Worms, like unto the Fish we call *Plaife*. But how these should get thither will be hard to determine. Some think they are bred there by Æquivocal Generation (without any Parent) which others will not allow, but think their very small Eggs might be carried there by the Chyle and Blood, and there hatched or enliven'd when fit Matter comes to make corrupted Nutriment fit for them; as it is with Seeds lying still in dry Ground till Rain or Muck comes; or Fly-blows, till the Meat is putrified, and made fit Nourishment for such-like Creatures. Another Symptom is *spotted Livers*; which it is possible may also be the Effect of Worms, or at least an Obstruction and Ferment made from the aforementioned ill Juice.

To prevent all this, I would propose that the great Quantity of Water be prevented, by driving them, in wet Seasons, to the driest Places they can, or to Salt Marshes; that, as I am told, purges away the over-great Moisture as it comes, and so leaves them in a tolerable Tightness; or, to give them Hay, Beans ground, or some other dry Matter, that may hinder the Wetness of the Grass from doing Mischief. I have heard of one in the North of England, that daily gave each Sheep a Bit of an Oat-Cake with good Success; and it is not only necessary to take good Care of their Insides, but also as much as may be to keep them dry without; a Way to do which is much used in the Northern Parts of England, and is as follows:

Between *Michaelmas* and *Christmas*, in *Yorkshire*, *Durham*, *Northumberland*, &c. the Farmers and Graziers fetch in all their Sheep they can find, from their Hills and Mountains, which are extremely wet, Winter and Summer; and having brought them into the Inclosures, they grease them after this manner: He that hath a Flock of Sheep of five or six Hundred, buys at the Time of Year thirty or forty Gallons of Tar, which he puts by five or six Gallons at a time into a Kettle or Pan over the Fire, first putting in about twenty Pounds of Butter; and so lets them melt, and by stirring be incorporated together, adding some Salt to it. With this Mixture, taken from the Fire and well beaten together, he greases his Sheep; opening the Wooll by Plats, greasing and chafing it into the Pelt or Skin of the Sheep, till he has greased him thus all over. A good Mangreaser will grease twelve Sheep a Day: And if they are not thus greas'd, they will not live three Years, but will die of the Rot, and being Pelt-beaten; so that the Wooll will drop from their Backs of itself.

I presume, the reason of this *Northern* Usage is, by *Imbalming*, to preserve the Sheep from the *Wet* as well as the *Cold*: And I am told, that in *Rumney-Marsh* in *Kent*, in the Time of extream hard Frosts the Sheep have been so benum'd with Cold that they could hardly stand; but did kneel to eat their Food, which numb'd them farther; but by rubbing their Legs with *Tar*, (which is a good Balm to refresh the weak Parts, and help on the Circulation of the Blood when it is almost coagulated) they have been recovered of their Numbness.

From what has been said, we may be easily directed to the Method of curing the Rot in Sheep, *viz.* That the Blood may be reduced to its Tone, and the Water gotten out of the Vessels may be evaporated; the likeliest Way to do which, is as follows: If not too far gone, by having the Parts so stretched, that the Quality of contracting is gone, as it is with an old Rope, that has been much stretched and used, and can never shrink up again, and be so tight as a new one will; and by having the Quantity of Water so great, that the good Blood and Humours from it is over-much cooled, and, as I may say, drowned in it; in which Case, altho' by a great deal of Care and Cost, more possibly than the Sheep may be worth, it is probable Life may be preserved, yet it seems to me unreasonable to expect a Cure. But before it is arrived to this Pitch, and being taken in the Beginning, *Vomiting* or *Purging* is very often successful. For the first, in *Cambridgeshire* they take three Bushels of Chamber-Lee, and mix it with one Bushel of Bay-Salt, and give the Sheep, fasting from the Fold, each a Horn full, or a little above a Quarter of a Pint; upon this they are observed, all of them, to bring up from their Stomachs vast Quantities of yellow viscous Matter. And this Experiment need be used but once as nigh the Time of taking the Rot as may be.

As to *Purging*, there may be several Things used; but I am told that the Salt-Marshes will do it effectually, and so cure them, for which reason they are so much celebrated; but where these *Marshes* are not, I like the *Cambridge* Medicine: And it seems to me reasonable, that it should be better than Purging, because the Convulsion that Vomiting makes, may not only *empty* that which would over-moisten, but by its force, sometimes *press out* some of the abundant Water.

After Evacuation the Parts must be strengthened, which is done by dry Meat, and warming hilly Food; and without doubt, would be much help'd, if *Alkalies*, which destroy sharp Humours and strengthen the Blood, were given. For Men, are given Spirits of Hartshorn, Soot, Urine, Powders of Pearl, Coral, &c. too chargeable for Sheep; but burnt Shells of Oysters, or any other Fish, Egg-Shells, burnt Bones, and several such like, given them as much as will lie on a half Crown, made up with any Thing in Balls, or given in any Liquor for three or four Mornings before the Sheep go from the Fold, will be of no great Charge, and very much strengthen the Parts: And the *Bay-Salt* being dissolved in Urine, as above-mentioned, is fit for this reason, the Salt in Urine being an *Alkali*.

Mr. *Ward*, a Gentleman who lived near *Dartford* in *Kent*, when he perceived the Rot or Dropsy in his Sheep, used to make a strong Decoction of Tithymale, and give the Quantity of half a Pint of it to each, which purged them very well; and in its Operation used to feed them with fine Hay: And he very seldom failed of Curing. The like Disease has been found in Cows, and other Cattle; near *Oxford* the Liver of a Cow was so much swelled with Water, that it weighed Seventy Six Pounds, and the Flesh was tolerably fat, but flabby: And I presume the Methods for Sheep, in greater Quantities, are good for these.

Dr. *Halley* informs us, that at *St. Helena* Sheep are very fertile, and commonly bring forth each two or three Lambs yearly; but they are there very short-lived, dying of this Rot; which he takes to be the Effect of the over-great Moisture on their Hills; which are half a Mile high, and so moist, as Paper in the Night cannot be kept dry enough to write on. And there is no doubt but Greasing, Vomiting, and what is above-said, may be useful to preserve the Sheep of that Island, as well as in our *Northern* Counties.

Sheep are on all accounts esteemed justly to be the most profitable Cattle to the Farmer, not only for their Increase, their Flesh and their Wooll; but also on the account of the Manure they afford of *Dung* and *Urine*: Which, by good Husbards, are preserved in Places where Manure is most wanted, by penning them up and folding them a Nights. And in some Parts of *Gloucestershire*, they house their Sheep every Night, and litter them with clean Straw; which not only Makes excellent *Soil* for their Land, but also makes the Wooll much finer. In *Middlesex*, and round about *London*, they buy a sort of Sheep from

from the *Western* Parts, which are wont to bring Lambs soon after *Michaelmas*; which, by being housed and their Dams well fed, prove exceeding fat and white, so as to become a Dainty to the great Mens Tables long before *Christmas*; and care is taken to have a Succession of them all the Winter: So that now there is hardly a Month in the Year, but you have fat Lamb in Perfection, and that at no excessive Price neither. Where there is a Demand for Lamb, it were easy to have it in other Parts of *England*. And this Dainty begins to present itself during the Winter even in the *North*; where indeed nothing is wanting in all the elegant Ways of Living. And this naturally encourages the Farmers to outvie one another in Diligence and Care, to furnish the Markets with such Curiosities as may draw out and circulate the Riches of those who would *live sumptuously every Day*.

Of GOATS.

THE Goat hath formerly been in much greater Esteem, than it is at present in these *Western* Parts of the World. The Flesh is very strong and rank; and therefore not so wholesome, at least to be eaten in any Quantity: However, for the sake of their *Kids*, or young Ones, which are by all allowed to be delicious Meat, they are well worthy the Care and Encouragement of such Husbandmen as have Land and Conveniences proper for them. They love and chuse *Bushes*, *Briers*, and *Thorns*, rather than richer Pasture. *Rocks* therefore, and the *Sides of Hills*, cover'd with these, and where it would be dangerous for other Cattle to approach, are best and most profitably stock'd with *Goats*. The Bucks have under their Jaws two *Wattles*, or Tufts, like a Beard: And the Hairs all over their Bodies are long, and therefore are sometimes shorn to make Mantles for Soldiers. Their great Heat and Lust should sometimes be abated and corrected, by being kept low; otherwise they grow old in six Years. They are very prolifick; sometimes a She brings forth two, and sometimes three *Kids* at once: But if the Dam hath not Milk enough, they must be otherwise supported, for they will be made fat with a little Care; and their Profit is derived from such Food as is worth little or nothing to other Creatures. As for the *Kids*, they are to be ordered in every respect as Lambs.

Of SWINE.

ALTHO' Hogs are the most hurtful, spoiling and ravenous Beasts, and are in themselves great Evils; yet they are almost necessary Ones to the Husbandman; who otherwise could make very little Profit of the Refuse of his House and Garden, and the Offal of his Barn. For which Reason, tho' they are greedy and voracious, and given much to root up the Ground and break Fences, yet the more Care must be taken to keep them rung or well yoked. There is a great deal of Art in chusing a good sort and right Breed. The Skilful say, a good Hog should have a long and large Body, thick Thighs, and short Legs; he should be lave-eared, deep-sided, and deep-bellied. Long-legged Swine deceive the Eye as well as the Butcher; the Colour is not very material, only some think the *pyed* the worst, as most liable to the Meazles. The little black sort with great Bellies have of late Years been introduced amongst us, and are by some much admired for the Sweetness of their Flesh, their quick and ready Feeding, and for the Delicacy of the roasting Pigs. But yet, tho' Gentlemen, for their own Use and Curiosity, may think fit to indulge this Kind, yet their want of Substance makes them not the Farmer's Choice, nor for his Profit.

The largest Kind of Swine, as well as the best-shaped Breed, is to be found in *Northamptonshire* and *Leicestershire*, where they have them in great Numbers; especially in the deep and clayey Parts of those Countries, where there are great Crops of Beans and Pease, which feed them excessively fat; insomuch, that sometimes there will be found to be forty Pounds of Fat upon the *Leaf*. But the Art of feeding a Hog well, is to give him only a little at a Time, and often. In woody Countries, they turn them loose in *Autumn* to search for Haws, Sloes, Pears, Crabs, and Nuts, but especially *Acorns*; and after a Fortnight or three Weeks, when they are glutted with these, they stie them up, and feed them with Pease or Beans; and some, with Flower of Rye or Barley made into a stiff Paste, letting them never want Water.

Those Farmers who live near great Towns, support their Swine much by Grains of Malt from the Brewers. However, these only make them grow, but do not feed them.

Hogs

Hogs are great Lovers of *Lettuce*, even after it is run to Seed; as also indeed they are of almost all Greens out of a Garden, except Turnips; but neither the Roots nor Tops of *these* will they eat. *Carrots* also are greedily eaten by them; and the Roots of themselves will make them fat. *Sweet Whey*, *Milk*, and warm Kitchen *Wash*, every one knows will make Porkets fit for the Butcher in a little Time. The Washings of Hogheads it is thought doth them more harm than good; but they will greedily drink it, and become thereby excessively drunk.

In the Management of Hogs, these Cautions ought to be carefully regarded: When the Hedges or Pyramids of *Eugh* are clipt, be sure to dispose of the Clippings, so that neither Hogs, nor any other Cattle, may come at them; for, upon eating them, they surely kill them. Let not your Hogs eat Man's Dung, nor Pidgeon's or Poultry's Dung, which generally bring the Meazles. And if you suffer them much to eat Carrion, Flesh, or Garbage; it will but teach them to devour the Poultry, or at least to be ravenous after young Chickens, Turkeys and Ducks.

In *Northampton* and *Leicestershire*, where Bean-Stacks are plentiful, they contrive to set them near some Water, and so hedge them round in the open Field: To which Stacks of Beans or Pease, they turn in a proportionable Quantity of Swine, cutting the Stacks down at the Top as fast as they eat the Bottom. And thus they live without any Attendance, by the Help of Water, till their Provisions are consumed, and they become fit for the Butcher, or to be sent to *London* in Herds.

Of the RABBIT or CONEY.

THE *Rabbit* or *Coney* is of two or three Sorts; and all of them, with Management, Care and Skill, become exceedingly profitable to the Farmer; who, if he would grow rich, is always to look about him, and in every Article and Circumstance of his Farm, is to consider *how* and *where* the Land may be stock'd and improved to the best Advantage. Where then it so happens that there are any large *Wastes*, *Heath Ground*, or *Barren Plains*, (especially if the Mounds and Fences are not made with *live* Hedges,) *there* nothing turns to the Farmer's greater Profit, than to stock such Ground with Wild Rabbits; which of all other Creatures useful in Life, are the greatest Increasers and Breeders.

Some Places are more singularly remarkable for the Goodness and rich Taste of *Wild Rabbits* than others; nor is it easy to assign the Reason of it. To be sure their Goodness does not always attend the Richness of the Soil, but rather the contrary. A dry sandy or gravelly Soil agrees generally best with them; but wet and boggy Ground is hurtful: For I cannot find that they are ever desirous of Drink or Water; at least, Observation always shews, that they do very well without it. The Rabbits bred in the Park at *Aukland*, one of the Seats of the Bishop of *Durham*, have been long famous and remarkably good; and yet they live amongst the Deer and other Cattle. In other Countries you find some of the *best* on the most barren Ground, where a Sheep can hardly bite.

Because their *Skins* at one Time of the Year in Winter are of more Value than their Bodies, I cannot forbear taking Notice of a Wild Rabbit, whose Skin gives *Six Times* the Price of the ordinary dun-coloured Rabbit, and whose Flesh is deemed still better too; and that is the *Silver-skin'd* Rabbit; much to be preferred therefore, and ought to be chosen by all those who have it in their Power. This Sort is but of late Years introduced amongst us; but now their Value and Profit makes them spread: For the *Furrier* every where makes great Demands for them; and I cannot find but they are as hardy and good Breeders as the other.

Tame Rabbits of the several Colours, are not less profitable in their Way and Proportion than the other; but because they are supposed to be under Confinement, and consequently require a particular Care and Management, I shall add the following Directions. But first it is to be observed, that this little Creature begins to breed at less than a Year old, bears at least Seven Times in a Year, (the Time of her Gestation being only a Month,) and brings commonly Five or Six at a Time, going to *buck* again soon after she has kindled; tho' it is a Mistake to fancy she *cannot* suckle her Young till she goes to buck.

Their *Tameness* is easily effected, by Reason of their natural Love of Solitude and Retirement, continually seeking to hide themselves in Dens and Caves of the Earth: But yet it is a Maxim confirmed by Experience, that the more they are confined and denied Enlargement, the stronger their Flesh eats and less palatable. The best Way therefore, is to allow them a good large Place well walled in, and another Place well covered, to which they may resort for Retirement and Shelter, from Rain, Dogs, and Cats, which are their

greatest Enemies; except it be the Buck himself, who, when they are much confined, will kill the Young Ones. To prevent which, the Female her self, as soon as she has kindled, will hide her Young, and close up the Holes, so that the *Buck* may not find them; in which Tenderness and Care she should be assisted as much as may be, by proper Materials *viz.* Wool, Hair, and Rags.

The constant Food, which ought to be given to tame Rabbits, both to preserve them in Health, and to remove all Rankness of Taste, is chiefly *dry Meat*, and not (as hath been so generally mistaken) always *Leaves, Grass, and Weeds*; which should rather be given them as *Physick*, than constant Food. *Oats* therefore are unquestionably good for them. But because it may be thought the Charge of such Food will out-run their Profit; *Hay* of the shortest Kind and Sort is a very proper Food, and they will very greedily eat it, and thrive upon it; especially if it is such as is made of *Clover* or *Trefoil*: One Load of which will serve Two Hundred Couple the Year round; which Stock will afford you Two Hundred Couple for the Family, and as many for the Market. It is very convenient to have little Cribs to put the Hay in, the Height of a Rabbit's Reach, which will be a Means to prevent Waste.

Not but that you ought, two or three Times in a Week, to give them an Armful of Thistles, Mallows, or other Refuse of a Garden; which will tend to cool their Bodies, as well as help to nourish them in this moderate Proportion. However, there are two Cautions to be observed, when Weeds and Greens are given to tame Rabbits: *First*, That the Dew be off the Leaves, before they are gathered and distributed. The not observing this Caution has been observed to cause the *Rot* in them, which is a Distemper they are subject to, and of which they frequently die. *Secondly*, That in cutting down Grass and Weeds for them, you carefully observe there is no *Hemlock* amongst them; for tho' they will eat it with Greediness, it is present Poison.

Every one knows the Method of taking wild Rabbits by Ferrets and Nets; and therefore I shall add no more on this Article.

Of such FOWLS as are most profitable to the Farmer.

THE constant Care and Art of the Farmer is to store himself with all such useful living Creatures, as may turn to his Advantage in the Market, and yet consume little else but what would otherwise be lost among the Chaff and Offal of his Barn and Stable. Of which kind are the known Fowls, *Hens, Turkeys, Ducks, Geese, and Pidgeons*. These bring considerable Profit; some by their Eggs, others by their Feathers, and all of them by their Brood and Bodies.

Hen.] The *Hen* is a very profitable Fowl: For with Care and Attendance one or other will lay Eggs and sit every Month in the Year. The Winter Broods indeed are very troublesome; but the Price of the Chickens in the Spring will balance that. If they are kept altogether on Oats, it is observed they will lay well, tho' it makes them poor; but if they are made fat, they commonly give over laying. For the Goodness and Whiteness of the Flesh the white-feather'd Sort are best, especially those that have short and white Legs: But those that have yellow long Legs and yellow Beaks, are good for nothing. The oldest Hens are the best *Sitters*, and the youngest the best *Layers*. Care should be used in the choice of the Cock; for those of the *Game Kind* are to be avoided, as no way for the Farmers Purpose. A *Hen* sits Twenty Days, whereas *Geese, Ducks* and *Turkeys* sit Thirty. Near the Time of Hatching, let the *Hen* have Meat and Drink near her, that she may not straggle from her Eggs and chill them. Superstition often governs where it should not; but the good Wife will keep to her old *Mumpsimus* of an odd Egg, when she sets her *Hen*.

Turkeys.] It is not two Centuries since *Turkeys* were first brought into *England*; and now they are become naturalized with us, they are observed to breed and thrive with little more Care than other Poultry. They are something tender when they are very young; but if Hatching-Time be deferred till *May*, that Difficulty is soon over. And when they are full grown, they will endure a cold Winter even better than a Duck or Hen: For they will perch upon a Gate or Wall in the coldest froly Night, with the Rime upon their Backs.

It is observed they will eat and devour a great deal, if you give them enough; but they will also do well with a little; and if left to their Liberty when grown up, they will get their own Living, by feeding on Herbs and Seeds and Grass. They are apt to ramble and straggle about more than other Fowl, and are sometimes offensive and troublesome in Gardens: But there is a very good and easy way to prevent that Inconvenience, by taking the Opportunity

Opportunity when you find them there, by a little Spaniel or sharp Cur, to teaze and weary them about, as long as they can stand or run; and at last they will take their Flight: By repeating of which, you may depend upon it they will come no more there. *Peacocks* are also to be thus used and cured.

It is a good way to give the Young Ones (as soon as hatched) every one a Pepper-Corn to cure the Coldness of their Stomachs, and for the same reason afterwards to mix Worm-wood chop'd small with their Food; which should be Curds for three Weeks or a Month, and their Drink be *new* Milk; for if *sour*, it kills them. The old fashioned way of feeding Turkeys, is by *cramming* them with Barley Paste; but under that Method they sometimes miscarry with being *choked*, either by Carelessness or Unskilfulness in not judging of a due Proportion. They will be very fat in the more natural Way, by feeding them that are intended to be fat by themselves. Their Eggs are esteemed delicate as well as wholesome, being great Restorers of Nature.

Duck.] The tame *Duck* is as necessary and profitable a Fowl as any other, and kept with less Charge; for if they have but the Advantage of Water and Ponds, they will fetch from thence the greatest Part of their Sustenance. She lays Plenty of Eggs once a Year at least; and in Sitting, where her own choice is, (which is best) she will cover Twelve or Fourteen Eggs, and bring them all to Perfection in a Month. The Young Ones will take the Water as soon as they are hatched; but if it rain, or the Weather is cold, they should be housed; for too much Wet quickly kills them, even after they are Two or Three Weeks old.

Goose.] The *Goose* likewise is a Fowl of great Profit for the Spit, as well as for her Feathers, which are accounted the very best for Beds. They are reared and managed much in the same manner as Ducks, being a sort of amphibious Creature, living both on Land and Water. Both Young and Old will live altogether on Grass; and their Dung is thought to be very wholesome for the Ground where they go, to keep Distempers from other Cattle. But Lanes, Highways, Commons and Wastes, are the properest Places for Geese to range in. A *Goslin* or green Goose in *May* is reckoned a Dainty, if made very fat: To do which you must shut them up at a Month old, giving them only ground Malt and Water or Beer, and they will be fit for the Spit in a Fortnight. Some think, that the upright Feathers on their Rumps being cut away will hasten their fattening; because, from thence with their Bills they suck out Moisture and Fatness. The *Stubble Goose* is also fattened in the same manner, and will be fat in the same time after it is put up. In some Places they find a Profit in *shearing* their Geese for their Feathers; others *pull* them twice a Year. This is the Practice of the Fen-Country, where they have vast *Droves* of them going on their extended Commons; and the Profit of these Feathers is very considerable, when they are sent in Quantities to the Markets in *London*.

Pidgeon.] There are great Varieties and Sorts of *Pidgeons* or Doves; and all of them so extremely profitable both for their Bodies and their Dung, that no considerable Farm should be without a Dove-house; because they are kept with little Cost or Trouble, except the feeding them in hard Frosts or Snow, when nothing else is to be had abroad; and again, about *Midsummer* in *Benting-Time*, as it is called, when they are forced by Necessity to live upon *Bents* and the Seeds of Grass. At which last Time especially Relief comes seasonably to them; not only for their own Sakes, but for the Sake of their young ones, which commonly are starved and perish for want of it. Mr. *Mortimer* tells us, he got a Pair of *Ring-Doves* Eggs, and hatched them under a tame Pidgeon; they liv'd with the Pidgeons, and bred so much better, that in a little time he had a great Increase of them, insomuch that he might have stock'd a Dove-house with them; which he thought might be worth while to do, by reason of the Largeness of their Bodies and their Hardiness; for they will live upon Ivy-berries, Turnips, and many other Things which a Pidgeon will not eat. However that be, the wild blue Pidgeon is a good Breeder, and will endure great Hardships: And if his Body be too small, you may mend the Breed by mixing among them some of the large tame Kind; and this I take to be the best and the wisest Course. But there is one Mistake which hath oft-times proved fatal to a Dove-house, and the occasion is not generally understood, and that is, when there are too many *Cocks*, especially of the tame Kind: For they will fight and beat all others from the Place, and so quickly make a thin Dove-house, if a Remedy be not found to lessen their Numbers.

There are several Methods used to tempt Pidgeons to stay, and to encourage others to come to a Dove-house. One very rational one is, now and then to lay Lumps of Salt, usually called *Salt-Cats*, mixt with aromatic Seeds, in some By-place within their House, to which they may at all Seasons have recourse. The Pidgeon is a hot Bird, and loves every thing that has Nitre and Salt in it; and therefore those *Salt-Cats* are found mightily

tily to delight them, and the Lumps will be quickly devoured: Thus it is found that Lime-Walls, which throw out Salt-Petre, will draw the Pidgeons to them, working out the Lime, &c. from between the Joints; the very Observation of which, I suppose, was the Mother of the Invention of *Salt-Cats*.

Another good Way, not only to encourage Pidgeons, but to support them, is to lay a considerable Heap of Clay near a Dove-house; and with it, on all Occasions, to mix what Brine can be spared from the House, tempering and stirring it well together. Hither the Pidgeons will quickly resort in great Numbers, and eat not only the *Salts*, but also the very *Clay* that is mixt with it. Pidgeons are very apt to be scabby on the Breasts and Backs; which Distemper commonly kills the young ones, and makes the old ones so weak and faint, that in a Time of Hardship a Dove-house will well nigh be destroyed with it. A very likely Cure to prevent which, is the abovesaid *Salt-Cats*, especially if an Ounce of *Affætida* be added, and mixt with the Lump.

The Pidgeon also loves Neatness and Cleanliness; and therefore the oftener the House and Holes are cleansed, the better, and the more they will be encouraged to stay and breed; especially if Care be taken that no Enemies approach to hurt them, their young ones, or their Eggs. Of which sort are Fulmores and Weezles; which are apt to creep in at invisible Places in the Foundation or elsewhere. But when they are once discovered, great Diligence must be used to catch them by Traps; otherwise they will soon make desperate Havock amongst the Pidgeons, especially their young ones. *Starlings* also are bold Intruders, and will suck their Eggs; for which there is no Cure but the Gun: The Cure also for Hawks, that assault the old ones without Doors.

The cheapest Way possible for building a Dove-house, is to make the Walls with Earth or Clay mixt with Straw, in the same manner as they make their Mound-Walls in *Northampton* and *Leicestershire*; which are not only durable and cheap, but singularly warm. I made a Dove-house my self after this manner; which answered my Expectations well, and cost me I think about five Pounds; being (if I remember) about four Yards square in the clear within-side. I made the Walls four Foot thick and twelve Foot high; and before I set on the Roof, and whilst the Walls were a little greenish, with a coarse Chisel I ordered a proper Number of Holes to be cut out square; which was done with a deal of Ease, the Walls being, as I said, not quite dry. The Holes were made (as they should be) a little dipping backward, and about fourteen Inches deep: So that when the Walls were covered with a Roof and become perfectly dry, they were a warmer Habitation for the Pidgeons than any other sort of Building made with Brick and Stone, tho' fram'd with Wood: And accordingly the Pidgeons prosper'd to a Wonder whilst I was in *Northamptonshire*.

Tares and *Vetches* are the Food which Pidgeons most of all covet and love; but *Pease*, *Beans* and *Barley* are good, and will make them breed well, even every Month in the Year, if they have enough. There are some exceeding large Sorts of tame Pidgeons near *London*; the young ones whereof come so early and are made so fat, that there is a constant Demand for them at great Mens Tables; and they will not (you may imagine) want for Price: For all populous Places encourage the Product and Sale of every Thing good in its kind.

By what has been said, it may appear how profitable a Dove-house is in its Produce and Increase; and the Value of the Dung I have elsewhere sufficiently explained. Neither will I go about to remove the silly Superstition of those, who are, with Art, made to believe that a *new Dove-house and Death are inseparable*.

Peacock and Swan.] *Peacocks* and *Swans* being generally kept more for Ornament and Fancy, than any great Use or Profit to a Farmer, it is out of my Purpose to be particular about them. The first are said (how true I know not) to clear the Ground of Adders, Toads and other venomous Creatures: The other will very much clear Ponds and Rivers of Weeds, which they greedily devour; and not *Fish*, as it is generally by Mistake thought they do. The *Flesh* of either is not worth much; tho' young *Cygnets*, fatted as green Geese, are by many thought a great Dainty.

Of B E E S.

THESE are two sorts of Insects greatly profitable, and highly deserving the Care, the Love, and the assiduous Attendance of every painful Farmer, studious and inquisitive after every thing that may make Returns of Profit, and fetch in an honest and commendable Gain; and these are the *Bee* and the *Silk-worm*; both of them deriving their Support and Riches from Vegetables.

The *first* of these, the *Bee*, falls under our present Consideration; which is an Insect, by All allowed to be an Example of Industry to a Proverb: Never idle, but when Work is dangerous or impossible; that is, in the extremest Colds, and in the wettest Seasons. They are early out in the Morning to gather Honey; when like Swarms they may be heard and seen clinging on the Blossoms and Leaves of Trees; and in the Evening late they return from their hard and assiduous Labours.

*At fessæ multa referunt se nocte minores
Crura Thymo plenæ ——— ——— ———*

V I R G.

In English thus:

*But those that youthful be and in their Prime,
Late in the Night laden return with Thyme.
On every Bush and Tree about they spread,
And are with Cassia and rich Saffron fed.
On purple Daffodils and Lindens tall,
All rest at once, at once they labour All.
Early they march, and stay till Evening drives
Them from sweet Fields and Food to shelt'ring Hives.*

Idleness is a Thing so hateful in this Commonwealth; that they will tolerate it in none save their Sovereign; for All are busied, either abroad in gathering Food, or at home in building Combs, or feeding their Young, or some other Employment: But the Drone and useless Bee is sure to die for it; or, as the Poet above elegantly describes their laborious Care,

*Venturæque Hyemis memores æstate Laborem
Experiuntur ——— ——— ———*

*Mindful of Winter, labour in the Spring,
And to the publick Store they Profit bring:
For some provide, and by a Compact made
Labour abroad; others at home are stay'd
To lay Narcissus Tears, and yielding Gum,
As the first Ground-work of the Honey-Comb.*

The Oeconomy and exact Government, which the Industrious and wise Bees observe amongst themselves, has exercised the Study and Pens of the ingenious and learned Observers for many Years past; and many considerable Volumes have been published on that Subject, in order to discover the Mystery of their Art in composing Combs, and lodging their sweet and liquid Treasure, as well as to understand the Wisdom of their Laws, by which the Peace and Welfare of their Government is secured*. For which Purpose, of late Years, *Hives* in octogone Frames have been contrived, with Glass on the Backside, thro' which may be seen the Motion and Working of the Bees; and they are also so ordered, that the Bees may have room to work upwards in Stories, to prevent the Inconvenience and Danger of their Swarming. This was first thought on and invented by a Kintman of my own, Mr. Mew of Gloucestershire: And it seemed to bid fair for a full Discovery of that mysterious Commonwealth, as well as to make great Improvements by saving the Lives of the Bees. But alas, there are still great Disputes; and we know not yet the Nature of their Laws, nor the End and Reason of their Motions. We know not

* It is said, the Philosopher Aristomachus spent Sixty Years in contemplating the Polity and Government of their Commonwealth, whose Basis is chiefly grounded on a mutual Love of one another.

certainly whether their Government be *Aristocracy* or *Monarchy*; whether they are governed by Many or by One; or, if it be a Monarchy, whether it be a *Male* or *Female* that governs. These Things are only Conjecture, and the Learned on both Sides think they can support their Opinions by probable and specious Reasons.

Besides, I could never yet see the great Advantage boasted of from these *Cases* or *Glass-Hives*, either as to a Discovery of their Government, or the Increase of their Riches. The Glass behind lets you see a great deal of their uncertain Motions; that they are *busy* and in a *hurry*, always in Summer moving from Place to Place; but you can make little of *what* they are doing, much less *how* they do it, or by what Authority. And then, as to the Advantage in Point of Profit and Increase, I could never find but that in a favourable Year, the *ordinary* Way of single Hives, and Swarming, as great an Increase both of Stock and Honey have been made, as in these late invented *Cases*; and in a bad Year, neither of them are found to do any great Feats.

Besides again, there is one Disadvantage which always attends these *Cases* or *Glass-Hives*, where the Bees work upwards, *viz.* that you are always forced to leave the latest and the best *Virgin-Honey* behind, and to be content with Honey of one, two, or three Years old; which every one knows is the worst and coarsest sort for all Purposes. For the Method is, before you take the Honey, to drive the Bees into the upper *Cases*, to save their Lives; and to thrust in a thin Piece of Board made for that Purpose through the Combs at the several Divisions of the *Cases*; ever beginning at the Bottom-Story, where the most and the worst Honey is. Whereas, in the ordinary Way of Hives, when you find that a *Swarm* or a *Cast* is too weak to go through the Winter, it may be taken up and made use of, as one of the greatest Delicacies at an elegant Entertainment.

Having said thus much of the Nature and Qualities of these new contrived *Cases* for Bees, it will not be expected that I should enlarge in their Description and Make: But if Curiosity excite any one to attempt a Trial to please his Fancy, he may almost in every Country meet with Specimens, which will be a better Direction than what can be expressed in Words.

It is certain there are no Creatures that live at more Unity among themselves than Bees. They seem to have all Things in common, and one is always ready to revenge the Injuries of another. Where there is any Degree of Curiosity in the Owner, nothing about an House doth ordinarily give more Pleasure and Profit than these; which take up little Room, provide their own Food, and require no great Attendance, except in Swarming-time. These Considerations have put many ingenious and inquisitive Persons, not only upon new Contrivances to save their Lives, as above; but also upon intense Studies and Observations on their Nature and Government, in order to supply them with such Conveniencies and Comforts as may assist their Labours, and encourage their Industry.

Mr. *Bradley*, who tells us he has been exact in his Observations on Bees, saith, there are plainly three Sorts distinguishable. The *first*, he saith, is properly called *Bees*; such as gather Wax, work it, make the Honey-Combs and Cells, gather the Honey and fill them, supply their Young with Food, keep the Hive clean, and defend it against their Enemies; all these have a *Sting*.

The second sort are called *Drones*, commonly much larger and of a darker Colour, something longer and thicker than the *Bee*. Of these there are but few in some Hives, and more in others. These *Drones* have the same Original with the Bees; for they proceed from the King or Queen-Bee: And as in the Hives it is observable there are some Cells, one third or one half longer than the common Cells, the *King* makes choice of these large Cells to lay those Eggs in from which these *Drones* proceed, assigning them Habitations proportionable to the Bigness they are to attain to in their full Growth. They have no Sting, and are seldom seen out of their Hives; and if they go out, it is about Three in the Afternoon, and in fair Weather; and when they return, they do not come laden with Wax as the other; for they only keep hovering about and humming in the Air, not far from their Habitation. They continue Part of the Summer dispersed in the Hives; and afterwards, as their Numbers increase, they draw together in Troops in several Parts of the Hive, where they lie cantoned, as it were, without making any Motion, from the End of *July* to the Middle of *August*: At which Time the common Bees attack them; and tho' they make what Resistance they can, they are at last all driven out of the Hive, and what becomes of them is not known.

When this Fight happens between the *Bees* and *Drones*, all the Bees are in Motion, as well without as within the Hives; and notwithstanding the tender Regard the Bees shew for these very *Drones* when they are young, it is amazing to see, that by the latter End of the Summer it should be turned to so universal a Hatred, that they do not spare even the

the young Drones that are imperfect in their Cells; but while one Party of the Bees is busy in driving the great Drones out of the Hive, another Party is employed in opening the Cells, where the imperfect Drones are, pulling them out, killing, and quite removing them from the Hive.

But there is yet a *Third Sort*, longer than the *Drones*, tho' not proportionably so thick, but of a more lively red Colour. There is for the most part but *One* of these in a Hive, and never above *Three*. This Bee hath a Sting, with a grave and composed Gate, and for that Reason hath been called the *King* or *Queen Bee*, and is the Mother of the rest.

This Bee is so fruitful, that she is thought to breed Eight or Ten Thousand Young Ones in a Year. She is for the most part concealed in the upper Part of the Hive; and is rarely, if ever, to be seen, but when she deposits her Young in such Combs as are exposed to the Sight. She is scarce to be seen but upon those singular Occasions, and oftentimes not then neither; because a great Number of Bees, hanging one to another, form a sort of Veil or Curtain from the Top of the Hive to the Bottom, and so often intercept the Sight of her; not removing till she has done *laying*.

When this *Queen Bee* (for we must call her so now she has been laying Eggs) appears in publick, about a Dozen Bees of a Size larger than ordinary always attend her, and as her *Retinue*, follow her wherever she goes. She moves with a very composed and grave Gate; and when she is about to *lay*, looks for an empty Cell, that has neither Honey, Wax, nor Embrio in it; and having put her Head into this Cell for a Moment, she immediately turns about, and thrusts in the hinder Part of her Body so far till it touches the Bottom of the Cell, the Bees of her *Retinue* still standing round about her, with their Heads turned towards her, and seem to caress her with their Trunks and Legs, and as it were, feast her. After a little while she comes out of the Cell, where a small slender Egg may be perceived to be left. And thus she passes from one Cell to another for Nine or Ten Times one after another immediately, her *Retinue* still waiting on her; and having done, retires again into the inner Part of the Hive, and is no more to be seen for some Time.

After Four Days these Eggs turn to *Maggots*, and the Bees afterward carry Honey for their Nourishment, and by the Eighth Day bring so much as to take up the whole Breadth, and part of the Length of the Cell; then they stop up all the Cells that contain these Worms, and take no more Care of them. In this Condition they remain Twelve Days, but suffer divers Changes, till at the Twentieth Day they become perfect Insects; and having made a round Hole with their Jaws in the Covers of the Cells, get out, come out of the Hive, go immediately abroad in Gardens and Fields, gathering Wax and Honey. When this young Bee is gone out of the Cell, there presently come *two Bees* to it; one of them takes away the Cover, chips it and uses the Wax elsewhere; the other is employed in putting it in the same hexagonal Form it was in before the Egg was laid there; and sometimes, the same Day a new Egg is laid in the same Cell.

As to the *Situation* of an Apiary, the first and chief Care should be to set it sheltered from Winds on all Sides if it be possible; and that End is better answered by *Hedges* than by *Buildings*, which do but form Eddies and circular Currents: For the want of *Shelter* is more prejudicial to Bees, than the want of *Sun*. Not that they should want the Sun to enliven, cherish and comfort them, even before they are able to stir abroad; but yet the over-bearing Power of the Sun's Heat at *Midsummer* sometimes doth great Injury, by melting the Wax and letting out the Honey. To prevent which, I should therefore chuse to let the Apiary face the *South East*, that it may have the Sun's Morning and earliest Influence, and not be hurt by the scorching Afternoon Heat, which it should lose by Two or Three a Clock.

In the common way of managing Bees in Straw Hives; if you intend to multiply your *Stocks*, you must make the Hives *small*; but if you aim to encrease your Quantity of *Honey*, your *Hives* should be the *larger*. And every Hive should be set upon a single Stool, kept clean from Weeds, which do but harbour Slugs or Snails, which are great Enemies to Bees. They swarm earlier or later, according to the Season: But about the Middle of *May*, if the Weather hath been temperate and kindly, you may look out for a Swarm. The usual Signs foretelling it are these: When the Hives are full, they will begin to cast out their Drones: They will hover about the Mouth, Evenings and Mornings: You will find Moistness and Sweating upon the Stool: They will run lustily up and down, and lie out Evenings and Nights that are sultry, and go in again when the Air is clear. In a hot Gleam, and after a Shower or gloomy Cloud hath sent them home together, then they chiefly delight to rise; and when they gather together at the Door, without hanging together in Swarming-time and not before, then you may almost certainly conclude they

they will rise if the Weather hold. But to lie out continually under the Stool or behind the Hive, especially toward the Middle of *June*, is rather a Sign or Cause of their *not* Swarming: For when once they have taken to lie without, and have Plenty of Food within, they are so set upon the Delight of their Riches, that they have no Leisure to swarm, tho' the Weather favour them to come abroad with Safety.

In order therefore to make Bees swarm, keep the Hive as *cool* as may be, by watering and shadowing both it and the Place where it stands; and then enlarging the Door to give them Air, move the Cluster gently with your Brush, and drive them in. If they will still lie forth, and not swarm; then the next calm and warm Day about Noon, whilst the Sun shines, let the better part be put in with your Brush, and the rest gently swept away from the Stool, not suffering them to cluster again: And so those rising in the calm Heat of the Sun, by their Noise, as tho' they were Swarming, will sometimes call the other forth, and so swarm together.

Divers other Ways have been tried to make them Swarm; as by placing a Platter or large Pewter-Dish under the Cluster of Bees as they are hanging out in the Heat of the Sun, or by smooth paring of the Ground under them, strewing the same with hot Sand. If none of these Methods will do to provoke them to swarm, but that they lie out still, then rear the Hive enough to let them in, and clay up all the Skirts but the Door; and if this Experiment fail, it may be concluded there is no Remedy.

The Signs of After-Swarms are something more certain; for when the Prime Swarm is gone, about Eight Days after, when another Brood is ready and hath again over filled the Hive, the next Leader or Captain begins to tune his Voice, at the Sound of which the Queen gives her Consent in a Bass-Note, and so they all quickly come forth. There is an idle Superstition of ringing a Kettle or a Bell while they are Swarming, as if *that* would hasten them to settle and compose themselves; whereas, on the contrary, all *Noise* is a Disturbance to them. The Origin of the Custom seems to have been only to give Notice to the Neighbourhood that there is a Swarm up; and if they should go astray, to signify to whom they belong: But to prevent that Danger, some do more rationally throw Dust or Sand amongst them to make them come down.

When a Swarm has chosen a lighting Place, which is commonly on the Branches of some low Trees, they presently knit together on a Cluster; and when they have settled, and the Cluster has been at the biggest for some time, then you are to hive them with as much Dexterity and Caution as possible, shaking them all at once, if it may be, into a Hive well rub'd before with Honey and sweet Herbs, and stuck with small white Wands. When a Swarm parts, and the two Divisions light in Sight of one another, disturb the lesser Knot, and they will fly to their Fellows; but if they chuse lighting Places not in Sight, then hive them distinctly, and afterwards bring them together, and they will readily unite.

So also, if your Swarm happens to come late in *June* or *July*, and less in Quantity than a Peck, put two or three Swarms together, if within two or three Days of one another; and by uniting them thus, they will labour hard, get a sufficient Quantity of Honey and defend themselves against their Enemies. This, as well as the former Work, must be done in an Evening.

The Age of a Bee is only Twelve or Thirteen Months. And therefore, toward the End of Summer their Number begins to lessen, and the last Year's Brood by degrees waste and die away, their Wings *first* failing them; so that only the Young of the preceding Spring survive to continue the Kind till the next Year. A little before or a little after *Michaelmas* is the best Time for removing Stocks from Place to Place, tho' any Time in the Winter before the Beginning of *March* may do; but *Swarms* are best carried and convey'd the Day after Swarming, as soon as the Bees are quiet.

The best Time of taking the Honey, is about the Middle or latter End of *August*; for after that they get more than they get. The common Way of killing the Bees, and saving the Honey, is to dig a Hole, hard by, a little bigger than the Bottom of the Hive, into which stick one or two Matches of Brimstone, Five or Six Inches long, so that the Top of them may be even with the Surface Top of the Hole. The Matches being fired, gently and dexterously lift off the Hive, and set it over the Hole, and immediately close up the Hive at the Bottom, that none of the Smoak may get out, and in a few Minutes the Bees will be all dead.

The Honey that runs out, without much squeezing or breaking the Combs is best, and should be preserved by itself for the best Purposes. The older the Hives are, the worse is both the Honey and the Wax: Therefore the best Honey of all others for eating at the Table, is that which is taken from *late* Swarms or Casts, which prove too light to stand

stand the Winter. And this is properly the *Virgin-Honey*, uncorrupted and undefiled either by Time or Mixture.

Because in the Attendance and Management of Bees, it is not uncommon to find the Smart of their Stings, and to feel the Effect of their Anger, which is no less than Poison to the Part affected, it may not be improper to direct a suitable Remedy. The first thing to be done is to pull out the Sting as fast as you can; and if near a Fire take a live Coal, hold it as long to the Place as you can possibly endure it, which will draw out a great part of the Poison; and applying a little Honey to the Wound, will perfect the Cure.

Some think, and speak it with Assurance, that a Copper Half-penny applied to the wounded Part will immediately assuage the Pain. and prevent the Swelling; and others assure us, that let the Sting of a *Bee* or *Wasp* be never so violent, if we supply some of the Milky Juice of the Fig-tree, the Pain immediately ceases and the Swellings abates, tho' it be never so violent. See *Bradley*, Pag. 93 for the Months of *August* and *September*.

There are divers Things injurious and hurtful to Bees; some of which I have occasionally mentioned before: But the chief Enemies to them are much Smoak; continued Noise; bad Weather; offensive Smells; noisome Creatures; Mice and Birds; Hornets and Wasps; and even Bees themselves, which will be ever and anon robbing one another, the *strongest* always assaulting the *weakest*: And this Battel is sometimes prevented by stopping up the Hive close for a few Hours; or by killing some of the Robbers as they come. Bees presently discern a Cloud that is like to end in a Shower; and therefore in such a Case they are observed to return Home in great Haste and Numbers. In many other Cases likewise they discover great Sagacity, and even communicate their Designs by the Motion of their Bodies. When they would remove their Station, *one* makes a Motion with her Wings, which causes a small Sound; *others* follow her Example and retire: And thus they prepare themselves for their daily Labour in the Morning, as well as when they prepare to set up a Commonwealth of their own by *Swarming*. Some think, that by the Motion of their Wings they give Notice to others to disburthen them of their Wax when they come Home laden; and that when one Bee is at work on the Combs, and wants Honey of another that has brought it Home, she thrusts out her Trunk, and takes it from between the Jaws of the other, and receives it without spilling. However probable these Conjectures are, I doubt they are far from Certainties.

Both Parts of the Bees Riches, the *Wax* and the *Honey*, are not only profitable, but useful both in Surgery and Physick. Besides the singular Use and great Demand of *Wax* for Lights and Candles, preferred before all others, it is in Surgery the Ground of all *Salves* for Wounds, and *Cerecloths* for weak Parts; besides, it ripens *Ulcers*, and mollifies contracted *Sinews*. Its *Oil* is thought of the most sovereign Virtue to cure Wounds, be they never so large or deep; for by the help of Stitching, it makes a Cure in Ten or Twelve Days at most; and by only anointing small Wounds, it heals them in Three or Four. A Dram of this *Oil* in white Wine provokes Urine, helps Pains in the Loins, and removes other sort of Stitches that are contracted by Colds.

The *Honey* also is not less useful and profitable: For besides that it makes a most pleasant Liquor for the present Drinking in the Summer called *Mead*, and also a more lasting and stronger-bodied Wine (which is a great Imitation of Sack or Canary) called *Metheglin*: Besides these, I say, and many other useful and excellent Purposes, for which Honey is accounted good and applied accordingly; it is accounted physically sovereign for opening Obstructions, clearing the Breast and Lungs of those Humours that fall from the Head: It provokes Urine and keeps the Body open, nourishing it, and breeding good Blood, and thereby prolongs Life. It is remarkable, that it keeps all Things uncorrupted that are put into it; and for that reason Medicines that are intended to be kept long are usually prepared with it. It is a great Ingredient in all the sorts of *Treacles*, and is esteemed good against *Pleurisies*, *Ptisicks*, and other Diseases of the Lungs. However, to some Constitutions it should be observed that *Honey* causes a very violent and immoderate Flux; therefore when that is once discovered, it should be either cautiously used or wholly neglected: But yet that Violence is very much corrected when it is *clarified*.

THE *Silk-worm* is another Insect that derives its Nourishment altogether from Vegetables; and considering the curious and invisible Method of working Webs of Silk out of its own Bowels, and the several odd Metamorphoses it undergoes, may be thought one of the most extraordinary Creatures in Nature. But besides its Curiosity, it is a most profitable Creature, when it meets with that kind Indulgence, which its Diligence and Industry calls for. It is but of late Years that the *Silk-worm* hath been introduced amongst us here in *England*; and as yet they are not encouraged, as they ought, in any great Quantities, or in many Places. The chief Obstacle seems to be the Want of Food, a sufficient Number of Mulberry-Trees, whose Leaves alone are undoubtedly (whatever some may say to the contrary) the proper Food, from which any Product or Profit can be depended on.

But besides this, there is another Discouragement which hath in great measure prevented the Removal of the former Obstacle; and that is, the Observation that the Diligence and Attendance required outgoes the Profit: But that this is owing to the Want of an established Manufacture, the Practice of Foreign Countries, as the like Defect in parallel Cases, demonstratively proves. The vast Riches of the *Southern* Countries, gained from the Labours of this little Insect, plainly shew that where no Accommodations or Materials are wanted to employ a Multitude of Hands in a regular Society and Combination of Undertakers, the Silken Manufacture must answer; and *we* may grow rich thereby in *England*, as well as *they* in *France* and *Spain*. For we every Day see, *those* that deal in little Quantities in any Way of Life, or in almost any Commodities whatsoever, because they have not constant and regular Employment for the Hands they are forced to use, and it may be at the same time wanting Abilities in the Methods of Commerce, grow poor and starve; whilst at the same time *others* in an established Society, dealing in great Quantities, and better consigning Hands to proper Places and Times, get vast Estates by the very same Commodity and Business which made the others poor.

As to the Objection which some make with respect to the Coldness of our Climate, I think there is not much in that; especially if the *Southern* and best sheltered Parts of our Island be chosen for the purpose. For we see with Pleasure, that in many agreeable Soils and Situations, the *Mulberry* thrives to a Wonder: And we see also, that from their Leaves the *Silk-worm* is nourished to Perfection. The Eggs are hatched the Beginning of *May*; the Worm eats, and encreases with her Food: At full Stature she spins her Web; the Male and Female engender; the last lays her Eggs and they both die, as in other Countries, within the compass of the Summer's Warmth and Heat. And if in lesser Quantities we can propagate and encrease Eggs, Worms and Silk; what should hinder us from doing more, and making the same Advantage to our selves and the Nation, which Foreigners acquire to theirs? I will not call it Sloth and Indolence, because I believe no Nation upon Earth have, of late Years especially, made greater Improvements in all sorts of Arts and Sciences, in Trade and Manufactories, than the *English* have done; but there is an Account to be given of this Matter less dishonourable, *viz.* the Pleasure and Profit of Gardening and Plantations seem to be but of late come into Taste. Three or four-score Years ago, there was but here and there a Man to be found that had a Genius for planting any thing but Oaks, Ashes and Elms in the Forest; and a Pear, Apple and Plumb in the Orchard. If a *Mulberry* happened to be found in his Grandfather's Garden, it was almost singular, and gazed at as a Rarity. And tho' in King *James* the First's Time (of more anon) there was a sufficient Hint given by that Prince, and a goodly Scene opened, presaging many future Advantages; yet *vis longa Vita brevis* took place, and little was done agreeable to that Prince's Exhortations for planting *Mulberries*; looking still at home, and on the present Generation, without much regarding what might conduce to the Benefit and Riches of *Posterity*.

However *something* was done, and those few ancient Trees we have are much owing to that Prince's publick Spirit; but yet a considerable Manufacture cannot be begun and carried on, but by such numerous Plantations, as may effectually answer all Demands; and *that* must be a Work of Time. Not but that I hear of late several large Plantations are begun with a view of a considerable Manufactory; and by this time must be arrived to that Maturity, that we may quickly expect to hear that foreign Silks must give Place to the *English* ones manufactured by a People of a superior Genius.

With a View and Expectation of something very considerable in this Kind, I shall lay down some Directions for the Management of the *Silk-worm*; not in the least doubting but that still some better Maxims, supported by the long Experience of those abroad, may be obtained hereafter, for the reader carrying on and perfecting this important Work.

It is, in the first Place, then to be observed (as I have already taken Notice under that Head) that there are two sorts of Mulberries, the one *Black*, the other *White*; both of them serviceable to the *Silk-worm*: But forasmuch as the *White* sort (tho' it hath but an insipid Fruit) is a quick Grower, and hath a smoother Leaf; it is *therefore* generally preferred and planted for the Use of the *Silk-worm* before the other, which hath a rougher Leaf. But, as I said, either of them will do well; the great Difficulty is to get enough of either.

About the Beginning of *May*, when the Mulberry begins at first to explain its Leaves, the Eggs of the *Silk-worm* should be laid in a Window in the warm Sun, or betwixt Flannels in some warm Place; for Heat and Warmth soon hatch Eggs. *Sooner* indeed this might be done; but it were to no Purpose to do it *sooner*, because their Food would not be ready for them. When they are hatch'd, it is usual to lay over them clean Paper full of Holes, and upon that Paper they lay the Mulberry-Leaves, to which the little Insects will soon find a Passage, and fasten themselves; and after that there needs little more Care during the Time of their feeding, but shifting their Leaves as Necessity requires, keeping them clean both from dead Leaves and their own Dung.

The slightest kind of Covering will serve the Turn, to defend the *Silk-worm* from the Injuries of the Weather. In *Italy* and *Spain* they are kept and fed in the same earthen floored Rooms, wherein the poor People live and spin, and do their other Household Affairs, feeding them on Shelves or Tables without more Curiosity.

In *Sicily* boarded Houses are commonly set up in the Fields round the Mulberry-Groves, with Shelves two Foot above one another to the Roof, and a Table in the midst of the Room; on both which they spread Leaves for the feeding the Worms. A Man and a Boy will attend all the Worms that come of six Ounces of Eggs, and those, one Year with another, will spin sixty Pounds of Silk worth 20 l. a Pound; in all 1200 l.

In *Turkey* the Worms are fed in long Barns made of Reeds or Canes, both Walls and Roofs; where they are fed, and afterwards spin their Bottoms upon the very Reeds, without more Trouble. Nay, it hath been known that even upon the very Mulberry-Trees themselves, where the Insects have been directed, the whole Charge of Attendance has been saved, and the Silk hath been brought to Perfection; which is undoubtedly the *easiest* and most natural way, but not the *safest*. For every Storm and Hurricane (to which the *Southern* Countries are most subject) and all Thunder and Lightning are fatal to the *Silk-worm*, and sometimes even within Doors. In which respect *England* is more happy, and on that account more preferable than even the *Southern* Parts, as not so subject to such Disappointments and Losses.

It is observed that the Worms are commonly sick three or four times during their feeding. Generally a Fortnight after they are hatched, and every Week after, two or three times. Their best Physick is to give them but little while they are sick. The whole Time of their feeding is about Nine Weeks: And as they get Strength and grow bigger, it need hardly be said that you must give them more and oftner, which will encrease the Attendance.

The Leaves, before they are given to the Worms, should be clear of Dew or Rain; and therefore if they are gathered early, they should be spread upon the Table to dry. Extremes both of Heat and Cold, or Drought and Moisture, are hurtful to this Insect. And therefore they should not be laid either near the Roof of an House, nor on cold damp Floors.

When they have fed as long as they are able, they begin to look clear and prepare themselves for Work; at which time they should have Air discreetly given them. Some lay clean *Heath*, or the Branches of *Lavender* and *Rosemary*, in the way of Arches, for the Worms to fasten and spin their Webs in: But the most advisable way (for the sake of clean winding off the Silk) is to make hollow Cones of Paper, and into every one of those put a Worm, where it will quickly make a Web, and in three Days cover itself all over with Silk, so as to be seen no more till it be suffered to work its Way out for the Business of Propagation.

In about a Fortnight they commonly finish their Bottoms. Those that first finish are usually reserved for Breeders of both sorts. The *Males* are distinguished from the *Females* by the Lankness of their Cases, the Ends whereof are longer pointed. When they are found

found loose in their Cases, both Male and Female will eat their Way out in four or five Days time, when they should be put together for Procreation on a large Piece of white Cap-Paper. One of these Females will lay from two to five Hundred Eggs; so that a few Insects kept for that purpose is sufficient. The rest (not suffering them to stay to eat their way out, because that is some Prejudice to the Bottom) should be put into an Oven of gentle Heat, just sufficient to kill the Worms.

The *Metamorphosis* of this Insect is very surprising; for it comes out of its Cell in the Form of a Butterfly, with four Wings, six Feet, two black Eyes, and a Pair of Horns. The *Males* fluttering with their Wings will soon couple with the *Females*; in which Posture they are to be left nine or ten Hours, from Morning till Evening, when the Females are to be gently pulled away, and the Males thrown away, as of no further Use. The Female then lays her Eggs, which are at first *white*, afterwards *green*, then *red*, and at length they retain the *grey Colour*.

The *Virginia Worms* are much larger than others, and they will wind Bottoms as big as a Lemon, fastening themselves naturally on the Boughs of the Mulberry-Trees, till they fall to the Ground and perish in Autumn; and such Eggs as escape the Birds are the natural Reserve for the next Year's Labours, as soon as the Heat of the Sun hatches them. Mulberries, both there and in *England*, will put out a second Crop of Leaves after the first are eaten and devoured.

The Method of winding the Silk off the Bags, is first to find their End, which is not difficult, and then put about a Dozen of them into a Basin of Water, wherein is mixed a little *Gum Tragacanth*, commonly called *Gum Dragon*; and thus they will be readily and easily wound; for the small Hairs of Silk seldom break; or if they do, they are with little Difficulty found again. Sometimes the Bottoms prove gummy; and then they should be thrown into a Lye of Wood-Ashes, or Soap-Boilers Liquor made scalding hot for a little while, and after that put into scalding fair Water.

But forasmuch as I have above mentioned the Encouragement given by King *James* the First, for carrying on the Silk-Manufacture, by planting and increasing Mulberry-Trees; it may not be unacceptable to the Curious to insert that Prince's Letter to the Lords Lieutenants of the several Shires of *England* to that very Purpose; because it contains, not only a true Zeal for the Good and Welfare of his Country, but substantial Reasons for the setting about so good a Work.

J A M E S, R E X.

Right Trustly and Beloved, We greet you well.

“ I T is a principal Part of that Christian Care which appertaineth to Sovereignty, to
 “ Endeavour, by all Means possible, as well to beget as to encrease among their Peo-
 “ ple the Knowledge and Practice of all Arts and Trades; whereby they may be both
 “ weaned from Idleness, and the Enormities thereof, which are infinite, and exercised in
 “ such Industries and Labours as are accompanied with evident Hopes, not only of pre-
 “ serving People from the Shame and Grief of Penury, but also raising and increasing
 “ them in Wealth and Abundance, the Scope which every free-born Spirit aimeth at; not
 “ in Regard of Himself only, and the Ease which a plentiful Estate bringeth to every
 “ one in his Particular; but also in Regard of the Honour to their Native Country,
 “ whose Commendations is no way more set forth, than in the Peoples Activeness and In-
 “ dustry. The Consideration whereof having of late exercised our Mind, who always
 “ esteem our Peoples Good our necessary Contemplations; we have received, as well by
 “ the Discourse of our own Reason, as by Information gathered from others, that the
 “ making of Silk might as well be effected here as it is in the Kingdom of *France*, where
 “ the same hath of late Years been put in Practice; for neither is the Climate of this Isle
 “ so far distinct or different in Condition from that Country, especially from the hither
 “ Parts thereof, but that it is to be hoped that those Things, which by Industry prosper
 “ there, may by like Industry used here have like Success; and many private Persons,
 “ who for their Pleasure have bred of those Worms, have found no Experience to the
 “ contrary, but that they may be nourished and maintained here, if Provision were made
 “ for planting Mulberry-Trees, whose Leaves are the Food of the Worms. And there-
 “ fore, we have thought good hereby to let you understand, that altho' in suffering this
 “ Invention to take Place, we do shew our selves somewhat an Adversary to our Profit,
 “ which is the Matter of our Customs; for Silk brought from beyond the Seas, will
 “ receive

“ receive some Diminution: Nevertheless, when there is a Question of so great and publick Utility to come to our Kingdom and Subjects in general, and whereby (besides Multitudes of People of both Sexes and all Ages) such as in regard of Impotency are unfit for other Labour, may be set on work, comforted and relieved; we are content that our private Benefit shall give way to the Publick. And therefore, being persuaded that no well affected Subject shall refuse to put his helping Hand to such a Work, as can have no other private End in us, but the Desire of the Welfare of our People; we have thought good, in this Form only, to require you, as a Person of greatest Authority in that County, and from whom the generality may receive Notice of our Pleasure, with more Conveniency than otherwise, to take Occasion, either at the Quarter-Sessions, or at some other publick Place of Meeting, to persuade and require such as are of Ability (without descending to trouble the Poor for whom we seek to provide) to buy and distribute in that County the Number of Ten Thousand Mulberry-Plants, which shall be delivered to them at our City of, &c. at the Rate of three Farthings a Plant, or at six Shillings the Hundred, containing five-score Plants. And because the buying of the said Plants at this Rate, may at the first seem chargeable to our said Subjects, (whom we would be loth to burden) we have taken Order, that in *March* or *April* next, there shall be delivered at the said Place a good Quantity of Mulberry-Seeds, there to be sold to such as will buy them, by Means whereof the said Plants will be deliver'd at a smaller Rate than they can be afforded being carried from hence. Having resolved also, in the mean time, that there shall be published in Print a plain Instruction and Direction, both for the increasing the said Mulberry-Trees, the breeding of the Silk-Worms, and all other Things needful to be understood for the perfecting a Work every way so commendable and profitable, as well to the Planter as to those that shall use the Trade. Having now made known unto you the Motives as they stand with the Publick Good, wherein every Man is interested, because we know how much the Example of our own Deputy-Lieutenant and Justices will further this Cause, if you and other your Neighbours will be content to take some good Quantities hereof to distribute upon your own Lands, we are content to acknowledge thus much more in this Direction of ours, that all Things of this Nature, tending to Plantations, Increase of Science, and Works of Industry, are Things so naturally pleasing to our own Disposition, as we shall take it for an Argument of extraordinary Affection towards our Person; besides the Judgment we shall make of the good Dispositions in all those that shall express in any kind their ready Minds to further the same; and shall esteem that in furthering the same, they seek to further our Honour and Contentment, (having seen in a few Years past that our Brother the *French* King hath, since his coming to the Crown, both began and brought to Perfection the making of Silks in his Country, where he hath won to himself Honour, and to his Subjects a marvellous Increase of Wealth) would account it no little Happiness to us, if the same Work which we began among our People, with no less Zeal to their Good than any Prince have to theirs, might in our Time produce the Fruits, which there it hath done. Wherefore we nothing doubt but ours will be found as tractable and apt to further their own Good, now the Way is shew'd them by us their Sovereign, as those of *France* have been to conform themselves to the Direction of their King.

Given under our Signet at our Palace of Westminster, Nov. 16. in the Sixth Year of England, France and Ireland, and of Scotland the Two and Fortieth.

By this may be seen the Sentiments of that Prince one Hundred Years ago, and what wise Dispositions were made for the future Glory and Riches of the *English* Nation. Something was done agreeable to these Royal Exhortations; but for want of Order, and an established Company of Undertakers, little came of it; and the succeeding Troubles in the the next Reign soon stifled all the best formed Schemes for the Publick Good.

As we have now a Prince reigning over us, who, by all his Actions and wise Administration, hath demonstrated that he wants neither Will nor Power to do us Good, and to promote the Interest and Happiness of his People; so we may have Reason to hope that some time or other, this among the rest will be thought a probable and reasonable Scheme, whereby to acquire Honour to himself, and an Increase of Riches to his Subjects.

FISH-PONDS being of such singular Use and Service to every Gentleman's Estate and Family, it will be expected something should be said of them, that may direct either the *making* or *preserving* or *stocking* them. It is then to be taken Notice of, that the low moory Grounds where *Sedge* and *Rushes* are wont to grow, are on all Accounts the best for Ponds; for if you consider that the Soil there, and what grows upon it, is not worth much; that when it is made a Fish-Pond, it receives all the Wash and white Water of the Uplands, which is singularly good for Nourishment and Increase of Fish; and also that there, if any where, will be Water found and preserved, even in the driest Summers. I speak not here of such as have Springs constantly to feed them: That is a separate Consideration, and requires separate Advice. But if we expect Fish to be large and fat, this is the Situation desirable for a Fish-Pond of every Dimension; but great Care should be had that it be deep enough and large enough for the Stock of Fish it contains. Depth is absolutely necessary to preserve the Fish, both from the Summer Heats and Winter's Cold; the last especially, which oftentimes proves fatal to the Fish for want thereof. The general Depth should be six Foot; and in some Places, chiefly towards the Head, something more; but the deeper the better.

The Head of the Pond, where the Sluice is to be set, will naturally fall to be on the lowest Ground, and should be made so, that, if possible, the Water upon Occasion may be drawn off pretty swiftly. The Difficulty of these Ponds made in the lowest Grounds, is, that as they receive proper Nourishment from Excrements, &c. so in time the Settlings of the same will bring on a Necessity of scouring and cleaning them, which should be done once in Ten or Twelve Years. But this Necessity brings Riches along with it; for the Mud taken out will more than repay the Charge when it is spread on the Uplands. This Necessity also brings on another, of having more Ponds than one, wherein to bestow the Fish while that Work is doing.

The right Contrivance therefore is to begin the String of Ponds where there is a small feeding Rill or Spring for a Command of Water for all below it, where there are no Springs; and then there will be proper Places for each sort of Fish, and for both Ways of managing them. The sharp Water, where the Springs are, will never feed Fish; and the thick Water, where no Springs are, will never *breed* them well; which should be well and constantly regarded to prevent Disappointments.

If you happen to be at any considerable Distance from breeding Ponds, there are some Difficulties in procuring a young Fry, and to bring them alive for the *Stocking* of Ponds. *Jacks* and *Pearch* are very difficult to carry safe above two or three Miles; but *Carp* and *Tench* will live better and much longer out of their own Element, and being lap'd up carefully in clean Straw (which by the way, is either better than Hay or Grass) have been known to be carried alive fifteen or twenty Miles; but neither is that to be depended upon, except in a moist Air. Some therefore have thought, that the best Way to stock Ponds at a Distance, is with the *Spawn* of the several Sorts of Fishes, which may be carried with more Safety twenty or thirty Miles: But as I have had no Experience of the Success of this, I can only recommend it to be tried by the Curious.

After the Pond is sufficiently stock'd with proper Fish, some put Bavins or green Faggots in two or three Places, staked down as a Shelter for the Fish on all Occasions, and wherein they will lay their Spawn with more Safety. It is better to *under* than to *over* stock; for Fishes of all Creatures are the greatest Increasers; both the Sea and the Rivers would soon be overstocked, did not Providence so order it, that the *greater* should devour the *less*. Three spawning *Carp*s put into a Pond of three Acres, and nine or ten Milers with them in *February*, were known to produce in *November* following, no less than nine thousand young Fry. And a *Bream* is thought to increase in Number much more.

But yet great Care is to be taken to manage this Affair with Prudence too, *viz.* to let the great Invaders, the Fishes of Prey, such as *Pike* and *Pearch*, be in a Pond by themselves; for they will soon devour every Fish that is valuable, and even their own Kind too, if any thing smaller than themselves: However, *Roaches* (worth little of themselves) that are great Breeders, are industriously put in with no other View but for *their* Prey. In *Cambridge*, where the best *Pikes* are, and where they have Plenty of Eels, *these* are their constant Food; by which, being cut in short Pieces, they feed them daily, and make them both large and fat.

The *Pearch* is a most excellent Fish; a Fish of Prey too: But not so much encouraged as he deserves; for with good Keeping and Time, he will arrive to two Foot in Length, and be little inferior to a Trout in Goodness. His chief Food is *Minims* and *Gudyeons* or *Worms*, or indeed any other of the smaller Fry of Fish. But it should be taken Notice of here, that there are two Kinds of *Pearches*, which in no Sort differ from one another but in their Bigness; the one of them (as hath been said) will be very large; but the other, tho' it live twenty Years, will never be above five or six Inches long. The Truth of this I have had Experience of my self; and I believe it is that which hath discouraged many from stocking a Pond with *Pearch*, happening to meet with the smaller Sort, which indeed is the most common one: I need not therefore say how this Disappointment may be remedied with Care.

Carp and *Tench*, especially when they come to be twenty or twenty four Inches long, are universally admired as the best of fresh Water Fish, and eat much better out of Ponds, where they are fed, than *Rivers*. It is not above two Hundred Years since the former of these was naturalized in *England*, being a Foreigner and brought first out of *Germany*. When they are small they are a very mean Fish, and full of little troublesome Bones; but when they grow bigger, they are fleshy, sweet and high tasted, growing fat with a little Care and Assistance of refuse Food from the Kitchen or course Paste; and if it be frequently given, they will in time grow so tame and familiar, as even to take the Paste or Bread out of the Hand; which, as it must be a Diversion and pleasant Amusement, so that Pleasure will soon be rewarded with one of the best Dishes at an Entertainment.

But the Method of fattening *Carp*, mentioned by the ingenious Mr. *Derham*, should not be omitted here: In *Holland*, (and it hath been practised in several Places in *England* too) they hang the *Carp* intended to be fed, in a Cabbage-Net in the Cellar, wherein they put clean Straw or Grass; through the Holes of which they feed the *Carp* daily with white Bread and Milk sweetened with Sugar, which in less than a Fortnight's Time will make them exceedingly fat: But it should be observed, that when the *Carp* sometimes begin to be sick for want of their own Element, the Cabbage-Net must be dipt in Rain or River Water for a Quarter of an Hour, and that will presently revive them.

Neither the *Carp* nor *Tench* are Fishes of Prey; and therefore they thrive best in thick Water and standing Pools, where little or no Springs are; where they have Depth of Water, some Mud for Shelter, and some Shallows, where they can come at Grass and Weeds. The Breeders ought to be kept by themselves, in Ponds that have gravelly or sandy Bottoms; and, if possible, that are fed with Springs: But one small Pond of this Kind is sufficient; for (as I have said) they are great Increasers.

The young ones out of these breeding Ponds may be taken with great Facility and Pleasure, by the Angle and Hook baited with a small red Worm; but the larger Sort out of the feeding Ponds are more shy and not so easily taken, except they by Use be brought to the Hand. A Casting Net will sometimes surprize one or two of them at the first Throw; but afterward (if there is any Shelter of Mud) you will find it Labour in vain; for upon every such Disturbance of the Water, they immediatly strike their Heads into the Mud, and so the Nets draw over their Tails without laying hold of them. The Angle baited with a Dew-worm will, at some certain Times before and after Rain, tempt here and there one to take the Hook; but the best and surest Way to take the larger Sort of *Carp* and *Tench* is by Bow-Nets and Tramels sunk here and there to the Bottom by Stones.

The *Trout* (one of the best of fresh Water Fishes) is very impatient of Confinement, being by the Shape of its Body long and slender; and the Strength and Elasticity of its Tail, made for Swiftnefs and Velocity to follow and overtake its Prey: However, there have been Ways found to make Confinement tolerable, and to make it even thrive in a Prison: As when a Contrivance is made to carry the Stream of a River in a Cemicircle thro' one Grate and out at another, admitting the smaller Fry of Fish into the Prison for their Prey, and suffering none of the *Trout* to escape. By this means I have seen *Trout* at *Salisbury*, in the Garden of my Friend Mr. *R. Thorp*, above two Foot long, every one of which he could at any Time command as an Entertainment for his Friend. Otherwise it is to no purpose to put *Trout* into standing Waters; for there they will neither breed nor thrive, but generally languish and pine away; or if they do live, they have nothing of the delicious Taste of a River *Trout*.

Bream, *Roach*, *Chubs* and *Barbel* are hardly worth preserving in Ponds. The first indeed in deep Waters will grow to a very great Size; but then they are generally five or six Years before they are a Foot long; and till they are very large they are hardly to be eaten, being full of Bones and insipid; and even when they are full grown, to the Age
of

of fifteen or twenty Years, they are never reckoned a Delicacy. *Eels* indeed will grow to a monstrous Size in Ponds and muddy Waters; but then they have a yellow Countenance and muddy Flavour, not comparable to those taken out of Rivers, which have Silver Bellies and a pleasant Taste.

The *Pike* is found by Experience to answer every way best in Ponds, where he can have Plenty of Prey or other Food; and it is not uncommon to take *such* an Ell long. It is observed that he doth not care to seize upon any thing unless it *stirs*, whereby he takes it to be alive. After every thing that is *such*, he is utterly voracious, and devours almost every living Thing that comes in his Way, whether it be Fish or Frogs; nay, even young Gossins and Ducks they will make no Difficulty to seize and devour; which the Farmer's Wife is to take Notice of as a Caution.

I remember, once angling with a pretty strong Line for a *Pearch* with a live *Minim*, it happen'd that as soon as the *Pearch* had gorged the *Minim*, a middling *Jack* came and seized both; which I soon perceived, and therefore let him alone with his Prey, till I thought I had him safe: However, as I was pulling out my gladsome Prize, there came a *Pike*, something bigger than that I had at my Line, and had like to have deprived me at once of a singular Treasure I had put my Heart upon. I mention this, to shew that the *Pike* will not only seize on those of his own Kind, but even on such as is not much his Inferior, swimming about with his Prey in his Throat till he can gradually digest it.

The *Pike* grows exceedingly above all other Fish, if he have his fill of Prey without much labouring for it. From five or six Inches he will arrive to twelve or fourteen the first Year, and the next to twenty three or twenty four Inches long, and proportionably thick. When his Head is *small*, his Belly *round* and *plump* and has withal a *yellow* Cast, these are plain Indications that he is fat and in good plight. The Difference of the Nature of Soils makes a great Difference in the Growth and Thriving of Fishes: For as the Fertility of some Soils nourishes double the Number of Cattle which others will do; so of Ponds it is found by Experience, that if the natural Soil is a fat Clay, Marle or loamy Earth, they will nourish and maintain double the Number of Fish that lean Heat-Ground or hungry Sand or Gravel will do; which last therefore may be much helped with the Drains from the Slaughters of Butchers, or even from Blood, Guts and Garbage themselves; on which *Pearch* and *Eels* will deliciously prey, if especially they are cut in small Pieces.

Indeed most Sorts of Fish, except *Pike*, will live in a manner in any Pond, and without any Feeding or Industry, as aforesaid; but then, as they are forced to live upon the Mud, Earth and Weeds, that grow in such Ponds, so it must not be wonder'd at that they taste accordingly.

I am aware, that it is the common Practice to plant Trees, Elms, Ashes, &c. on the very Edges of the Banks of Fish-Ponds, with a View of Shelter and Shade; but I am very well satisfied this is a Mistake, and doth a great deal of Harm, especially if the Trees are many, and set so near and projecting as to drop all or most of their Leaves into the Pond. I have known a Pond of clear wholesome Water so poysoned with Leaves, that not a Fish of any Sort would live in it; but after it was cleaned and the Trees removed, it proved an excellent breeding Pond. Shelter indeed is right, and of use, at some Distance to defend the Ponds from violent Winds and the Severity of black Frosts; but the Branches of large Trees projecting, so as to drop the Wet and Leaves into the Pond, should not be suffered, except here and there a *Willow* for a little Shade in extreme Heats, whose Leaves do the least Harm.

And now I mention the *Frost*, I must caution likewise against a common mistaken Practice very hurtful and fatal to Fishes; and that is, the breaking the Ice in hard Weather under a Notion of giving them Air in those Extremities. Whereas, if it could be supposed (which is very much doubted) that Fish in such Cases die for want of Air, the Practice of breaking the Ice doth but deceive them, and draw them into greater Danger: For whilst they are at the Mouth of such Holes, (invited thither perhaps by Light and more Room) they are frequently surprized with the Severity of the Cold, and there are found frozen to the lower Surface of the Ice; whilst those at the same Time which retire to the Deeps, and almost cover themselves in the Mud, escape and out-live the greatest and longest Frosts.

Several Observations have been made of the Lives of Fishes; by which it appears that all or most of them are very long-lived, from the least to the greatest; and that the *Carp* particularly has lived near an Hundred Years. Most of them are *oviparous*; but the biggest of them, the *Whale*, is *viviparous*, bringing forth young ones (commonly two only) which she suckles; and some think that the *Eel* is *viviparous* too. They seem to enjoy the Power of

of Sensation as perfectly as Animals that live in the Air. And as to their *Sight*, there can be no Dispute; for they seem to exceed in the Quickness of that Sense many other Animals; and by their chusing some Baits and refusing others, neither *Smelling* nor *Tasting* seem to be wanting. The Sense that comes most in Question, and has been disputed, is that of *Hearing*; but if the Experiment Mr. *Bradley* mentions to have been made at *Rotterdam* by himself and a Friend of his, was rightly and truly carried on without *Motion*, it may satisfy us that neither is that Sense wanting.

“ The Gentleman having filled his Pocket with Spinage-Seed, with which he was wont to feed his *Carp*, they both came to the Side of the Mote, which was of considerable Extent, standing mute for some Time, the better to convince him that the Fish would not come till he had called them. At length, being desirous to see the Event, he *called* in his usual Way, and immediatly the Fish gathered together from all Parts of the Mote in such Numbers, that there was hardly Room for them to lie by one another, and then he flung some Spinage-Seed amongst them, which they devoured very greedily: Nay, he tells us what is more considerable still, that at Sir *William Bowyer's* near *Uxbridge*, there is a Pond of *Pikes* or *Jacks*, which are a much more wild and untameable Fish than the *Carp*, and these they usually *call* together to feed.

Since it is so very necessary that all Fish-Ponds should sometimes be freed from their Filth and Mud, for the better Preservation and Increase of the Fish, it may not be amiss to advertise, that for Conveniency the best Way is to make the Ponds long and narrow, and not square, that the Workmen may at one or two Throws at most, be able to cast the Mud out on the Banks; for the Price of which Sort of Work, every Pole Square of Mud, a Foot deep, is worth 6 *d.* a Pole to fling out, where it may be done at one Throw; but where two is required, it is worth 12 *d.* a Pole.

Of MINES, MINERALS, and QUARRIES.

NATURE's Riches and the Improvements to be made and raised from the Earth, are by no means to be confined to the *Surface* thereof. The Earth's *Bowels*, as well as the *Superficies*, are hidden Treasures, made to be explained and laid open for Man's Use; for the Exercise and Labour of *Some*, and for the Riches and Accommodation of *Others*.

It hath been a long Time a Dispute among the Learned, whether Minerals, Stones, and Metals, *grow* and *vegetate*; whether they admit of any gradual Increase, as Vegetables or Animals; because no Observations made within the Compass of Man's Life and Memory, will give the least Light for any Discovery. That some of the hardest *Stones* and *Marbles* at this Day found in the Bowels of the Earth, were once soft like Mud, and capable of receiving heterogeneous Bodies into their Composition, is, I think, plain to a Demonstration, from the frequent Mixture of various Shells, Fish-bones, Bits of Plants and Animals, found even in the hardest Parts of their Substances: But, whether, when they are thus once consolidated, they afterwards admit of Growth or Increase, is not so easy to determine. The Veins of Metals forming themselves between the Rocks and different *Strata* of Earths, like Branches of Trees, strongly tempt one to imagine, that they do really grow like Plants, and receive Augment from *Exsudations*, and the minute and loose Parts of Mineral Matter, gradually cohering to their outward Substances.

It is true, the Process of Nature in this Sort of Vegetation is so slow, that five Hundred or six Hundred Years, or perhaps as many Thousands, will give no manifest Proof or certain Indication of the Augment and Increase of Minerals; but if they grow and vegetate, (as there is all the Reason in the World to think they do) there is no Necessity that the *Time* of their Growth should be limited by such Periods as we are wont to assign to other Vegetables. We may go back, if we please, for Time as far as the *Mosaic* Creation, yea and as many Thousand Years beyond it, as the Necessities of Nature may be thought to require: For it is agreed by all, but those whose Education hath too much straitened their Way of thinking, that the Beginning of *Time*, of Days and Years, respect only the *Inhabitants* of this World; and that when *Moses* tells us God made this World, he did not (then at least) *make it out of Nothing*; but, to answer the wise Ends of his Providence, made it a terraqueous Globe, a fit Habitation for such a Creature as Man, for a determinate Number of Years unknown to us. But who shall go about to limit the Almighty Power, Wisdom and Foreknowledge of God, with Respect to what hath gone before, or what shall follow after. He has wise Ends to serve by all the Revolutions and Changes of Planets, Comets, and fix'd Stars; and knows how to adapt them, so as to serve the Purposes and answer the Necessities of his Creatures.

Neither doth this Way of Thinking in the least weaken the Authority of *Moses*, in his History of the Creation; which was manifestly and wisely formed *ad Captum Vulgi*: He certainly spoke and wrote (as he ought) not like a *Philosopher*, but as a *Lawgiver*; and prudently compiled and worded his History agreeable to the Capacities and Understanding of the *Jews*, for whose sake he chiefly wrote it; not always * perhaps as Things *were* in themselves, strictly and properly speaking, but rather as they *appeared* to be; still with this constant View, to magnify the Power and Wisdom of God.

So that, to return to what we were saying, if Iron, Lead, Copper, Silver, or even Rocks of Stone of all Kinds, &c. grow no more in a Thousand Years, than an Oak doth in one single Year, this may still be called *growing*; and tho' their Substances are bulky, and their Veins far extended, yet since we are not bounded by Years nor Time in our Imaginations, we have still room left in our Minds to proportion the one to the other; because, whatever Alterations the outward Surface of the Earth may have suffered and undergone, we have no Reason to think its inward Parts have been much changed.

Leaving then this Dispute about the Growth of *Minerals*, let us next see what it is that Nature generally affords us in the Bowels of the Earth in this our Island; which I believe must be allowed to be richer in this Article also, than any other Part of the Globe of the like Extent. We have some *Gold*; more *Silver*, and *Copper*; and Plenty of *Iron*, *Tin*, *Lead*, *Coal*, *Allum*; besides vast Varieties of *Marble* and *Stone*, which afford Materials for Building, and all the useful and ornamental Purposes of Life. But, as I have observed that this Island is singularly rich in *Mines*, so I must also with Pleasure take Notice, that the Bishoprick of *Durham*, though a small County, contains greater Variety and Plenty of these Riches in its Bowels, than any one Part of the Kingdom besides: For throughout the Middle of this County, from the Sea-side to the Western Parts, run several Ridges of Mountains of great Extent, stored with Plenty of the best *Lime-stone* in *Europe*; which is eagerly sought for and fetched by those distant Country-men, who are unfortunately destitute thereof, for the Purposes of Building and manuring their Land.

In the *Western* Parts, where these Riches fail, there Nature hath supplied them with Plenty of *Lead* in divers Places, especially about *Stanhope* and *Aukland*, &c. out of which is extracted a considerable Quantity of *Silver*. All which employs a great many Hands, and makes the Country both populous and rich. And then again, where these Treasures are wanting in almost all the flat Country, and especially near two navigable Rivers, the *Tine* and the *Were*, there are found those inexhaustible Mines of *Coal*, for which there is a Demand from almost all Parts of *Europe*. But because I shall have Occasion to say more of this presently, I will only add further, that besides all this, there are almost every where found Quarries of excellent Stone, as fine as *Portland* or *Ketton*, which make the most beautiful Floors and Chimney Pieces.

And now I am speaking of the Beauty and Excellence of the several Quarries of Stone, dug in the Bishoprick of *Durham*, I cannot but observe that *these* also are frequently found upon or near the navigable River *Were*, which runs to *Sunderland*; by the Help of which, we are erecting and carrying on at the Mouth of the Harbour, a magnificent and beautiful *Pier*, by virtue of a small Duty laid upon Coals; which at once demonstrates the Use of it for Navigation, as well as the Riches of the Country. It is to be four Hundred Yards long, in a small Curve, and eight Yards wide; its Sides neatly jointed and smoothed; and the Surface a little enclining, is paved with the same fine-grained Stone, with which we make Floors and Chimney-pieces; and on that Side most exposed to the Tide, is erected throughout a handsome Breast-Parapet-Wall, which adds much to its Usefulness and Beauty. The whole is carried on by Commissioners; who have committed the Care and chief Contrivance of the Work to Mr. *Lellum*, an able and expert Engineer. It is not yet quite half finished; and before it is compleated, there will be expended little less than 20,000 *l*. And although this is a Burthen which will scarcely be felt, it will raise such a goodly Pile of Stone, as must be the Admiration of All, though possibly mixt with a little Envy in Some.

But, that I may proceed a little methodically in this *Chapter of Mines*, I shall speak distinctly of the several Kinds; not so much to shew the Methods of winning them, (which would lead me too far beyond my Purpose) as to shew the Variety of hidden Treasures, which lie couched in Nature's Bowels.

* Thus (among many other Instances which might be given) we know by all Experiments and Discoveries, that the Moon, like our Earth, is a dark Body, borrowing and reflecting all that Light we see, from the Sun. And yet *Moses* saith, God made two great Lights, the greater to rule the Day, and the lesser the Night; only because the Moon appeared to be a Light.

And because *Gold* and *Silver* are with us seldom found in any Quantities, but as they are sometimes mixt with other Metals; I shall first speak of *Copper*.

Of COPPER.

WHICH is a natural Metal growing in the Earth without any kind of Mixture, or other Help by the Art of Men; and it is of the middle Value, of a reddish Colour, and the first Material of Money.

England hath divers Copper Mines. At *Kenswick* near *Scotland*, great Quantities of Copper have been dug: Some Mines of Copper Oar have been found in *Yorkshire*; there are some Mines in *Staffordshire* that produce excellent Copper Oar; and in the West of *England* and in *Wales*, there are good Oars. In the *Staffordshire* Mines, the Veins of Copper lie from Eight to Fifty Yards deep; but all dip'd on the North-East: The Proprietors break the Rocks with Gunpowder, and get three sorts of Oar, viz. *Black* the best, a *Yellow* the worst, and a *Mixture* of both; which in Times past were smelted at *Ellaston*, where they had Mills, &c.

In *Derbyshire* there are also Mines, near the *Peak*, out of which they dig Oar; and when they have washed the Lead Oar in a great Vat, they cast the Refuse upon Heaps; which of late Years has been dug up again, and certain heavy Lumps, which were not Lead Oar, picked out. These are put into Casks and sent to *Hull*, and thence to *London*; and out of these, when refined, very good Copper is taken.

At *Trevaesus* in *Cornwall*, I am informed, there has been dug more than One Thousand Tuns of Oar; there is one spot of thirty two Foot broad and eight Foot deep, and how long none can tell, of this Oar. We have lately found out the Art of Calcining the Oar with Reverberatory Furnaces and Pit Coal. At the greatest Copper Works in *Hungary*, the Body of the Copper being strongly united to its Oar, (the Separation whereof is very difficult) the Oar is burned and melted fourteen times: And they get Silver, by adding Lead to the Copper when melted; and when Cold they give a strong Fire again, as it lies on cross Bars, until both melt and fall through; and when the Copper has pass'd its last Melting, they cut it in Pieces fit for Use.

There are many Samples of Copper Oars in *Gresham College*, as *Yellow*, *Black*, *Massy*, *Native*, *Capillary*, &c. brought thither from many Parts of the World, as well as *England*.

Every one knows Brass is made from Copper mixt with *Lapis Calaminaris*, &c. which is found in greatest Quantities in *Germany*; and some is said to be found in *Somersetshire*.

Of TIN.

IN the *Philosophical Transactions*, there are large Accounts of Tin Mines in *Cornwall* and *Devonshire*. And in *Gresham College* there are Specimens of Tin Oars of several Colours, viz. *Blackish*, *Brownish*, *Purplish*, *Reddish* and *Yellow*; so good that they need little or no Preparation by Stamping or Dressing for Blowing: Neither is there any considerable Waste in Melting.

Dr. Plot, in his *History of Staffordshire*, says, that at *Walsall* they make a great Variety of Iron Wares; in perfecting whereof they use a great deal of Tin, which they superinduce over them, to give a better Lustre and preserve from Rusting, and to prevent others from giving a Taste of the Metals to Things boiled in them: For Performance whereof they use Methods and Materials proper for each Metal, viz. for Iron, they melt in a Pan, Tin and yellow Rosin, which will swim above the Tin the thickness of a Crown-Piece; into which the Wares being first soaked in old sharp clarified Whey to cleanse them from all Filth, and duly beaten, and then dip'd into this Mixture, being shak'd about by Mediation of the Rosin, they become Tinned all over: And for Tinning smaller Brass Wares, they put them all together in an Earthen Pot, and heat them over the Fire to a due Proportion; then put in a suitable Quantity of Tin, and when it is melted they cast in some *Sal Armoniac*; by Mediation whereof the Brass admits the Tin, which when shaken together, the Work is finished.

In Tinning Copper they use the same Methods, only instead of *Sal Armoniac* they use *Black Rosin* to unite the Metals; with which they rub the Vessel all over, and then apply the Tin, and so proceed as above. That the Operations are so, all our Workmen must know;

know; but *why* these Materials, above all others should perform these Feats, is a Question perhaps hitherto *unproposed*, much less *determined*. But,

The great Use of Tin is to make Pewter with; which is a Mixture of three, four, five or six Pound of Copper to one Hundred Weight of Tin; and the finer the Tin, the more Copper. To take of ill Colour, is sometimes added a few Ounces of Spelter, and of this sort of Mixture are made Dishes and Plates; but Pots for Measure, Chamber-Pots, &c. have an Allay of Lead in them, being a coarser Composition of Metals.

Pewter is light and porous, therefore it is hammer'd much to make it close and serviceable: Dyers Vats are made of it. Tin mixed with Copper, in Proportion as Two to Seven, makes Metal for Bells, Organs, &c.

Of IRON, and IRON-WORKS.

IRON, Bishop *Wilkins* says, is a Mineral of a hard Consistence, *close, ductil, fusil*; it is reckoned among the perfect natural Metals, such as of themselves grow in the Earth, without any kind of Mixture, or other Help by the Art of Men; and it is of a more base and common sort, being the usual Matter for Weapons and Tools.

Of Irons there are many sorts at *Gresham College*; as, *Brush Iron, Iron Oar, Iron Stone, &c.* dug in *Gloucestershire* in the Forest of *Dean*, and in *Wiltshire, Herefordshire, Monmouthshire, &c.* and Dr. *Plot*, in his History of *Staffordshire*, tells us, that in Digging for *Iron Stone* they meet first with a small Bas, then a strong Bas, then a Stone from its Colour called a Blue Cap; and after that the Iron Stone of a darkish blue Colour, which ordinarily lies there not above two Foot in thickness.

On *Mear-Heath* they observe, in Digging for Iron Stone, that if they meet with Rocks, Sand, Gravel and Clay, that the Head of the Mine is quickly eaten out; especially the last, which so keeps down the Head, that it comes to nothing presently; all which they count bad, the Works being thinner and more chargeable to dig: But if they meet with Mine-Earth which is white; then they promise themselves good Mines both of *Iron Stone* and *Coal*, which, as at most other Places, lie here together; the *Stone* above the *Coal*, between four Fingers and half a Foot thick, having Bas above and below it; in which they meet an Iron Oar call'd Ball Stones distinct from the Vein, and then indeed it is thicker. Where Iron Stone and Coal lie together, they call it the deep Mine; which is not the best, the chalky Mine and the little Mine being preferred before it.

About *Dudley*, where the Iron Stone lies under ten Yards thickness of Coal, and above the Heathen Coal of a considerable thickness, it is divided into divers Measures of different Denominations; as the *Black-Row-Grains*, the *Dim-Row-Grains*, the *White-Row-Grains*; all so called from Earths of those Colours in which they lie; the *Rider-Stone*, the *Cloud-Stone*, the *Bottom-Stone, &c.* At *Walsal* and *Rusbal* they divide their Iron Oar into *Black-Bothum, Grey-Bothum, Chatterpye, Grey-Measure, Mush, and White-Measure*: The two last the Principal sorts, but *Mush* the best of all; some of it being a small Comby Stone, other some round and hollow, and many times filled with a brisk sweet Liquor, and is so very rich an Oar that it may be made into Iron in a common Forge. This sweet Liquor is thought to be the Matter of Metals before it is coagulated into a metallick Form; for some of it being dried pretty hard, and burnt in a Crucible, it quickly matures into *Iron*.

At the *Orkneys* they are now Digging for *Iron*, where they find it in great Plenty. And likewise at many other Places in *Staffordshire* they dig *Iron Stone*; the several Measures and Sorts whereof have obtain'd different Names, tho' gotten but a very little Distance from one another. Of the Oars they make several sorts of Iron, differing in Goodness according to the Richness or Poverty of the Oars, and having their Names somewhat agreeable to the Qualities of each Metal: The *first* and meanest they call *Yellow Share*, a sort that runs all to Dirt, and is good for nothing; and such is the Iron made of the *Camock-Stone*, the lowest Measure of Iron Oar about *Dudley*, which is so sulphureous and terrestrial, that it is not fit to make Iron: This sort some call *Red-Share*, because a Plough-Share made of it will crack in the Red-Heat. The *second* sort is stiled *Cold-Share*; which, tho' it will not break when Red-Hot, yet in Hot-Heat or Cold, the biggest Bar of it may be broken with a small Blow upon the Anvil. The Oar for this Iron they have at *Red-sreet, Apedale, &c.* and the only Use of this Iron is to make small Two-penny Nails, and Sheathing Nails for Ships, having broad Heads and short Shanks, to keep the Timber from being eaten by Grubs. The *third* sort is call'd *Blend-Metal*, of which is made large Nails and all sorts of heavy Ware, such as Hammers, &c. and in some Parts, Horse-shoes;

shoes; the Oar comes from *Wednesbury* and *Darlaston*. The *fourth* and best sort they call *Tough-Iron*, of which the best Wares are made, there being nothing so good but may be made of this; for which they have their Oar chiefly at *Rushal*, and some from *Watsfall*, but not so good: Of these Irons they make all their best and finest Wares *mediately* or *immediately*; for the best Iron of all is made out of the Filings and Parings of the Lock-Smiths; which they make up into Balls with Water, and dry them by the Fire till hard, then they melt it in the Fire by Blast, licking it up with a Rod of Iron, and then beat it into a Bar, and this they use chiefly for *Keys* and other fine Works.

Before the Oar is fit for the Furnace, it is burnt or calcin'd upon the open Ground for three Days with small Charcoal, Wood or Sea-Coal, to make it break into small Pieces; and this they call *Annealing*, or fitting it for the Furnace. In the mean while they heat their Furnace for a Week's Time with Charcoal, which they call *Seasoning*; and then they throw the Oar in with the Charcoal, and by two vast Pair of Bellows placed behind the Furnace, and compress'd alternately by a large Wheel turned by Water, the Fire is made so intense, that after three Days time the Metal will begin to run, still after encreasing till in fourteen Nights time they can run a Sow and Pigs once in twelve Hours; which is done in a Bed of Sand before the Mouth of the Furnace.

From the Furnace the Sows and Pigs of Iron are brought to the Forges; which are of two sorts, but commonly standing together under the same Roof; one whereof is called the *Finery*, the other the *Chafery*. In these two Forges they give the Sow and Pigs five several Heats before they are perfectly wrought into Bars. First in the *Finery* they are melted down as thin as Lead, where the Metal thickens by degrees into a Lump or Mass, which they call a *Loop*. This they bring to the great Hammer rais'd by the Motion of a Water-Wheel, and first beat it into a thick Square, which they call a *half Bloom*: Then they put it into the *Finery* again, and bring it again to the same Hammer, where they work it into a Bloom, which is a square Bar in the Middle, with two square Knobs at the Ends, one much less than the other, the smaller being called the *Ancony End*, and the greater the *Mocket Head*: Then the *Ancony End* is brought to the *Chafery*, where after it has been heated a little time it is also brought to the Hammer, and there beat quite out to a Bar, first at the End; and after that the *Mocket Head* is also brought to the *Chafery*, and wrought under the Hammer into Bars of such Shapes and Sizes as are the most fitting. Those they intend to be cut into Rods are carried to the Slitting Mills, where they are drawn through Cutters, which are of divers Sizes; and when cold, they are bound into Faggots fit for Sale. And this is much the Method used in Sir *Ambrose Crawley's* Iron Works near *Newcastle*.

In melting of Iron Oar, some have great Regard to the Make of the Furnace, and placing the Bellows, and the Hearth of the Furnace into which the Oar and Coal fall. This Furnace is ordinarily built square, the Sides descending obliquely, and drawing near one another toward the Bottom like the Hopper of a Mill, where these oblique Walls terminate, which is termed the *Boshes*. There are joined four other Stones, which are commonly set perpendicular, and reach to the Bottom-Stone, making the perpendicular Square that receives the Metal; and these, according as they may be pitched, less *transhaw*, or more *borrow*, will mend or alter the Mixture of the Iron; if *transhaw*, or transferring from the Blast, the Iron will be more cold-shear, less fined, more indeed to the Mafser's Profit, but less to him that has the Manufactory of it; whereas the Iron made in a *Borrow-work* is much more tough and serviceable. Nor is the ordering of the Bellows of less Concern, which have usually their Entrance into the Furnace between the Bottom of the Hopper or *Boshes* and the Bottom-Stone, and are placed nearer or farther off, according as the Oar and Metal require. It is also of Importance in melting of Iron Oar, that there be five or six *Sowes* made under the Furnace in parallel Lines to the Stream that turns the Wheel, which compresses the Bellows, to drain away the Moisture from the Furnace: For should the least drop of Water come into the Metal, it would blow up the Furnace, and the Metal would fly about the Workmens Ears; from which *Sowes* they must also have a *Conical* Pipe about nine Inches at Bottom, set to convey the Damps from them into the open Air, which otherwise would also annoy the Workmen even to Death.

The hardening of Iron in *Staffordshire*, they perform with old Shoes burnt, Urine, and Wood-Soot; and *Brittle hardening* with old Shoes, Tupper-Horns, Bay-Salt, and Argol or Tartar; which harden Iron to the Height, and give it the brightest Polish. Others say, the toughest Hardening is made with the Juice of Nettles, Man's Urine, and Linseed-Oil; and the *Highest* of all, by quenching hot Iron in the Juice of *Moufear*.

But these Hardenings have been reckoned only *superficial*; there therefore is another Method, used by a Person at *Bromley*, to harden whole Bars of Iron *quite through*; the Manner thus: He has a round Oven built of Brick, like a Baker's at the top, having a Grate in the bottom near the middle, about a Foot and a half or two Foot wide, where he lays the Coal, on each side whereof and at the end beyond it he lays his Iron, inclos'd in Coffins made of *Amblescot* Clay, to keep it from melting; the Coffins being proportioned to the Bars of Iron, which are broken into Lengths of between three and five Foot long, the longest being placed at the end of the Oven, and the shortest on each side; each Coffin containing half a Ton of Iron. When the Fire is put to it, it is constantly tended Day and Night, till the Operation is perform'd; which, according to the Goodness or Badness of the Coal, is done in a longer or shorter Time, sometimes in three Days and three Nights, other times in four, and sometimes not under a Week's Time; the critical Minute in which the Operation is finish'd being the great Secret of the Art of making *Iron into Steel*.

There are divers Ways of giving a due Temper to Iron; for one Temper is required for drawing it into *Wire*, another for a *File*, another for a *Chisel*, another for a *Sword*, &c. For the hardening of Iron for Files, this is commended: Take Horse-Hoofs, or Rams-Horns, and hang them over the Fire till they drop like Glew; take likewise pieces of Leather, and burn them black: Powder them both, and put to them stale Urine, and Bay Salt. Let them stand together some Years, the longer the better. Case the Iron with this Mixture, and give it a strong Heat, sufficient to fuse the Mixture for three Hours, and then cool it: The Surface of this Iron will be as hard as the hardest Steel, and will make excellent Files; but the Hardening reaches not to the Heart of the Iron.

Besides hardening of Iron, in Iron-works there are frequent Occasions for softening it; which may be done with *Oil*, *Wax*, *Suet*, *Butter*, *Affsaetida*, *Sulphur*, &c. the Iron being daub'd over with any of these, and then heated red-hot, and suffer'd after to cool in the Fire by degrees, as it goes out of itself.

As to the Virtues of Iron of *Rufma*, (a brown and light Iron Substance) with half its Quantity of Quick-Lime steep'd together in Water, the *Turkish* Women make their Ointment to take off their Hair wheresoever they please.

There are many medicinal Preparations of Iron and Steel, all accounted great Alteratives, and Purifiers of the Blood. Nay, it is thought that Steel does good in Dropsies, Green-Sickness, ill Habits of Body, and in many other Cases; but Iron (the chief Virtue whereof proceed from its Salt) being more porous than Steel, and yielding its Salt easier, has been preferr'd in Medicine to Steel.

What gives Virtue to some medicinal Waters, is their passing through Veins of Steel and Iron.

Of ALLOM.

Perfect *Allom* is a Compound made of a *Stone* dug out of a Mine, of a *Sea-Weed*, and of *Urine*. The *Stone* is supposed to be found in any Quantity, no where but in the Hills in *Yorkshire*, between *Scarborough* and the River *Teas*, and also near *Preston* in *Lancashire*, the same being of a bluish Colour, and will clear like *Cornish* Slate. The *Mine* that lieth deepest in the Earth, and is indifferently well moistened with Springs, is accounted best; but too much Moisture cankers and corrupts the Stone by making it *nitrous*.

For the more convenient working of the *Mine*, (which sometimes lieth under a Surface or Cap of Earth twenty Yards) they begin their Work on the Declivity of a Hill, where they may have the Convenience of Water, and dig down the *Mine* by Stages, to save Carriage, and so throw it down near the Places where they calcine it.

This Mineral, before it is calcined, being exposed to the Air, will moulder in Pieces, and yield a Liquor whereof *Copperas* may be made; but being calcined, is fit for *Allom*. As long as it continues in the Earth, or in Water, it remains an hard Stone; but sometimes a Liquor will issue out of the side of the Mine, which by the Heat of the Sun is turned into natural *Allom*.

The Demand of *Allom* is chiefly from the Tanners and Leather-Dressers; and it is also a necessary Ingredient in the Dyers-Vats; for without it they cannot well set their Colours. Accordingly, there are great Quantities thereof sent abroad into Foreign Parts. Neither is it less useful to the Sugar-Boilers for the finest Loaf-Sugars, for some physical Preparations, and for Salves, &c. in Surgery.

Of LEAD.

LEAD is a natural Mineral, *close, ductil, and fusil*, of the most base and common sort, more soft than other Metals, and therefore not *sonorous*. There are of this a great Variety at *Gresham College*; as Christalline Lead from the Mine, Oar rich in Silver, Lead Oar, &c.

With *Lead* several Counties in *England* abound, especially the *North* and *West*; and the *Mendip* Lead Mines (in *Somersetshire*) are very considerable; but in some Counties we hear of none; and not much in *Staffordshire*, where *Dr. Plot* says it is dug in a yellowish Stone; and the Workmen distinguish it into round, small, and smithum Oars; the two last whereof are beaten to Pieces, and the Oar separated from the Stone, and then washed in an Iron Sieve, the better to clear it from Terrestrities; which done, it is sold to the Potters for Six or Seven Pounds the Ton, who have occasion for most that is found here for glazing their Pots. There was a Lead Oar dug at *Ribden*; but none were ever considerable; and in the Bishoprick of *Durham*, where there are great Quantities, it is observed that where there is much Coal, there is less Lead; altho' at *Mendip* two or three Hundred Weight of good Lead Oar is found growing to a Vein of Coal.

Lead, by reason of its great Plenty in *England*, as also its Cheapness, Fluidity, Ductility and Durableness, is put to abundance of Uses, relating to Building, Waterworks, &c. And it is mightily improved of late by a new Invention of *Milling*, which renders the Sheet exactly equal in all its Parts, and more smooth and solid than Cast Lead can be; whereby it becomes more beautiful and serviceable for all Purposes, (and especially for covering Houses, Churches, &c.) wherein Lead is used, than the other; it being to be had of any Thickness desired, and the Sheets of Three Foot and a half broad, above twice as long as the Plummer can cast, if required. Besides, the thinner Sort of three Pound to a Foot Square, with the Nails made of a mixt Metal agreeable thereto, is an excellent Sheathing for Ships; for it is a certain Security against the Worm, and much better for failing than Wood-sheathing can be, and with respect to its Duration, &c. about *Cent. per Cent.* cheaper.

By melting, Lead may be *purged*, viz. by adding white melted Wax or Grease to make it flame; and then putting it into hot Water, it may be calcined or burnt, so as to be powdered by help of Fire or sharp Liquors. The *Calcination* of Lead is by melting it in an earthen unglazed Pan, and stirring it over the Fire with a *Spatula*, till it is reduced to a Powder. If you increase the Fire, and still calcine it for an Hour or two, it will be more open, and fit to be penetrated by Acids. If you calcine this Powder in a reverberatory Fire for three or four Hours, it will be of a red Colour, and is called *Minium*, or *Red Lead*: And if you take two Parts of Lead melted in a Pot or Crucible, and add to it one Part of Sulphur; when the Sulphur is burnt out, the Matter will be in a Black Powder, which is Burnt Lead. All these Preparations are drying; they unite with Oil or Fat in Boiling, and give them a solid Consistence; therefore they are mixt with Ointments and Plaisters.

In the Calcination of Lead, as well as several other Things, it is observed, that altho' the sulphureous or volatile Parts of the Lead do fly away in the Calcination, which should make it weigh less; nevertheless, after a long calcining, it is found that it increases in Weight. This is referred to the Disposition of the Pores of Lead in such a manner, that Part of the Fire insinuating into them, does there remain embodied, and cannot get forth again; whence the Weight comes to be increased. I am informed that Lead that weighs in Air, Thirty Pounds, weighs in Water but Twenty Seven Pounds; and that a Piece of unmelted Lead will swim in melted Lead.

A great many Bullets for Musket and Pistol are made with Lead, by being cast into Moulds; and also Shot, after another manner. Lead (besides the Uses commonly known) is also employed for refining Gold and Silver; and from it is made a Salt and many other Medicines, as may be seen in Dispensatories.

N. B. There is a sort of Lead by some called *Glack*, much used by the Potters for *annealing* or leading their Pots, which is abundantly found in some Parts of *Wales*: Which in the Description is often mistaken for that which is properly called *Black Lead*, of a quite different Nature from the other, and is wont to be used only for Pencils, and for Combs for Hair, &c. This sort is only found, by what I can learn, in *Cumberland*, and bears a very good Price for the Uses aforesaid: For tho' there has been found some in the *West-Indies*, much of the Nature of this; yet forasmuch as upon Trial it would not bear

bear the *Saw*, it has been rejected as of little Value. The *first* Sort of Black Lead, called *Glack*, found in *Wales*, is very different in its Nature from this, which is *infusible*; whereas *that*, to answer its End, must be and is *fusible* in the Potter's Fire.

But in the Bowels of the Earth are also contained rich and fruitful Mines of *Salt* and *Sulphur*, of which I shall treat next.

Of SALT, SULPHUR, &c. in the Earth.

DR. *Willis*, in his Enquiry into Chymical Principles, and of what mixt Bodies (*viz.* Animals, Minerals, and Vegetables) are made, and from what Parts Fermentation proceeds, affirms that all Bodies or Things when analized, and their Parts separated by Fire, are to be resolved or brought into *Spirit*, *Salt*, *Sulphur*, *Water* and *Earth*; and from the different Motion and Proportion of these Five Principles, the Beginning, Growth and Ending of Things, and chiefly the Reasons and Varieties of Fermentation are to be sought.

He tells us that *Spirits* are Substances highly subtle or fine, and always striving to fly away from the Subject they are in, but are retained with more thick Parts; which thicker Parts they, being mixt with, dispose to Maturity; that is, they still striving to get away, raise the thicker Parts with them: By their Presence they keep the mixt Body together, and open them by their Departure; and thus they bridle the Irregularities of *Sulphur* and *Salt*.

Sulphur is a Principle of a little thicker Consistency than *Spirit*, and after that the most active; for when the Spirits fly away, the sulphureous Particles endeavour to follow: The Temper as to Heat and Frame depends chiefly on Sulphur; and for the most part from hence arises the Variety of Colours, Smells and Tastes; Beauty and Deformity. The Substance of Sulphur, tho' less subtle, is yet of more *Fierceness* than the Spirits; for unless it be restrained by some more gross Parts, it destroys itself with too much Violence: Indeed the little Parts of it being gently moved, cause Digestion and Ripeness, Sweetness and many perfect Qualities in Things. Being a little more moved, they cause Heat; and an Excess causes great Disorders, and chiefly a stinking Savour; but a violent and extreme Motion brings the Dissolution of Bodies with a Flame and Burning.

Salt is of a little more fixed Nature than either *Spirit* or *Sulphur*, not so apt to fly away; but bestows a Closeness and Solidity on Things, as well as Weight and Diuturnity. It retards or slackens the Dissolution or Separation of Bodies or Things, and promotes Coagulations and Sticking together, and very much resists Putrefaction, Corruption and Inflammations, because it fixes the *Sulphur* and *Spirit* that are apt to fly away; wherefore heavy Woods, Stones, Metals, and what abounds in Salt, will hardly burn, and remain a long while free from Corruption.

The Fruitfulness of the Earth, and the Growth of Plants, take their Original from the Operations of Salt. *Salt*, when almost void of Spirit and Water, but bound together with Earth or Sulphur, grows into Stones, Metals or Minerals, which is imitated in making Glass or Earthen Wares; but when it is loosed from its Fixedness with the Earth, and mingled with Spirit and Sulphur, and diluted with Water, it ferments; and being so put into Motion, there is observed a threefold Condition, *viz.* *Fusion*, or Melting; *Volatilization*, or Readiness to fly away; and *Fluxation*, or Running about.

From *Fusion*, proceeds a rude and indigested Formation of Things, an ingrateful or unpleasant Smell, and for the most Bitter or Biting: From *Volatilization* of Salt, proceeds Beauty, Fairness and pleasant Smell, as in florid Blood of living Creatures, in ripe Fruit, Sugar, Milk and Honey: From *Fluxation* of Salt, proceeds the ingrateful Sourness of Wine, Milk, Blood, and eatable Things, that at first were grateful and sweet. And from the aforesaid Three Principles, Spirit, Sulphur and Salt, (which are called *Active*) we come to the other Two call'd *Passive* Principles.

The first is *Water*, which carries the Spirit and Sulphur about, and by whose help they mix together, and also with Salt; and were it not for the Water to keep them in Motion, they would grow stiff as if frozen. When *Water* is wanting, Things wither; when it abounds, they are sluggish and flow. Bodies too moist, are liable to Rotteness and Corruption, and then the Water easily flies away, and carries with it the Spirit and Sulphur, and leaves the Body dead, or made sharp with Salt, which we call *sour*. From hence it is that Infusions of Vegetables, (such as Beer) Decoctions, Juices of Herbs, and all watery Preparations, if they have too much of the Water, they easily corrupt.

The last Principle is *Earth*, which, with the Water, helps to extend and fill up Things. The more Earth there is any Body, that Body is less active, and lasts longer: Hence Mi-
nerals

nerals endure long; next the greater Trees; when Animals and more slender Plants are but short liv'd. But I am now to shew you how these Principles agree and disagree.

The Spirit and Sulphur agree very well, and easily mix and fly away together; but Spirit and Salt are not so easily join'd: For Sugar and Salts are scarcely dissolv'd in rectify'd Spirit of Wine; (Spirit distill'd so high till it will all burn away; or if Cotton or Gunpowder be put in, it will burn till it dries, and makes them take fire.) To which I'll add, that when Brandy is burnt with Sugar, the Sugar will not dissolve till the Spirit is almost burnt away. But Spirit and Salt, by the Mediation of Sulphur will easily mix together; and as Spirit best agrees with Sulphur and Water, so Sulphur intimately cleaves to Earth and Salt. But as Spirit does not join with Salt, so Sulphur does not with Water; for fat and oily Things, as also Gums and sulphureous Resins, either swim upon the Water or sink down to the Bottom: But sulphureous Things (Salt coming between) are mixt with a watery Liquor, as we see Oils mixt with Sugar or Salt will dissolve in Water, which otherwise would flow separate.

Salt, besides its Affinity with Sulphur, is also most strictly united with Earth; wherefore Stones, and the more hard Minerals, consist chiefly of Salt and Earth. In Glass, Salt and Earth are so strictly join'd, that by no means can they be separated; but Salt is most easily dissolved in Water; it melts of its own accord in a moist Air, and these are as easily separated one from another.

From the various Combinations the Principles have various Names; for Sulphur, when joined with Spirit, is called *pure and sweet*; with Salt, *impure and stinking*; when with Salt and Earth, it is call'd *thick and earthy*; when the Spirit takes sulphureous Particles, it is *sweet*; when saltish Particles, *sharp*; when both, *bitter*. And Salt is known by divers Names; for beside the Names of Fluid, Fixed, Volatile, it is termed Marine, Aluminous, Nitrous, Vitriolick, Aromatick, or of some other kind.

Dr. *Wilkins* reckons Sulphur among such earthy Concretions as commonly grow in Mines, and are dissolvable by Fire, inflammable, of a dry Consistence and yellowish Colour. And Dr. *Grew* gives an Account of a great many Sulphurs in the Repository at *Gresham College*, particularly of Native Sulphur, chrysalized, of a pale golden Colour sent from *Peru*, and the like from the Pike of *Teneriffe*. There is also a Lump of Native Sulphur like *Olibanum* Drops, or opacous yellow Amber, from the same Place. Two Pieces of Oar; the one Earth of a brown, the other Stone of a Sand Colour and gritty. Native Sulphur of *Iceland*, of the Colour of common factitious Brimstone, and immersed in a stony Bed. Some of a curious Orange Colour, extracted from Gold Oar. Sulphur Oar of *Freyburg*. One Piece almost like Cinabar, which in Fire smells like Brimstone, but flames not. Two of blackish and Ash-coloured Parts mixt with Red; in the Fire they are like the first inflammable, but smell not so strong. A Green Sulphur Oar. Oar of *Iceland*, opacous, and immersed in a bluish Glebe.

Dr. *Plot*, in his *History of Staffordshire*, says, that the Coal of *Wednesbury* has much Sulphur; from whence might be made Rolls, Flower of Brimstone, or Oil of Sulphur *per Campanam*; and believes, that and the Pyrites to be the Cause of Earthquakes: He also gives Accounts of divers sulphureous Waters, with many Cures they have done; but their being Sulphur, *appears* not, but is found out by divers Experiments and Conclusions from them.

From Sulphur or Brimstone are made abundance of Medicines, of which there are Accounts in the Dispensatories.

Nitre, or Salt Petre, Dr. *Wilkins* reckons a factitious Substance, having some Analogy to such earthy Concretions as grow in Mines, dissolvable by Fire or Water, and not inflammable, of the more simple sort, being a kind of Salt of the Air, used as a chief Ingredient in the making Gun-Powder.

Dr. *Willis* says, that Nitre or Salt Petre is not to be enkindled by itself, tho' a strong Fire will melt it; but being mixt with sulphureous Things, it flames with Force and Explosion; for being added to common Sulphur, Antimony or Tartar, it burns with a thundering Noise: Also if you put into it melted a burning Coal, the Flame is cast forth round about with a Wind; so that the Matter put in is flung up and down, and often quite out of the Vessel: By this means the Nitre is consumed, and the fixed Salt (which is Tartar) remains.

From hence Nitre seems to consist of abundance of Salt and a little Sulphur, both ready for Motion; tho' the Salt is too strong for the Sulphur; but when that is help'd by another enkindled sulphureous Body, the Particles of Salt are disjoined, and the little Bodies of Sulphur fly forth with Violence. To prove it is Sulphur, is urged its burning Quality in Agriculture, flaming Colour, and Generation among sulphureous Excrements of Animals.

Mr. *Henshaw*, F. R. S. thinks the Air to be full of Nitre; and tho' it may be extracted from the Earth, the sulphureous saline Particles are imbibed from the Air, by Cavities in alkalous or other acid Bodies, as I have shewn in my Account of fertilizing Earth, and impregnating Lime, &c.

Of SALT made, and SALT-WORKS.

DR. *Wilkins* reckons Salt to be a factitious Substance, having some Analogy to the Mineral, and dissolvable by Water, not inflammable, being a more simple Kind from Sea-Water, and the most necessary Condiment for Meat.

Most Authors make a Difference between *common Salt* made from Brine, or the Salt from the Sea, and *Rock-Salt*; but Dr. *Halley* thinks them all one, and he proves it thus: He made a Brine with common Salt, and fully satiated it, so that a good Quantity sunk to the Bottom in Form of white Salt; then he hung in this Brine for many Hours, a Piece of Rock-Salt, but there would not one Grain of it dissolve; but when other sorts of Salt were put into it, they dissolved presently: From whence he concludes, that the Rock-Salt and common Salt were of the same Species of Matter.

Dr. *Grew*, in his Anatomy of Plants, &c. thinks Sea-Salt nothing else but that of Animals and Vegetables carried thither and freed from their other Parts, which he endeavours to prove by an Experiment; but considering Dr. *Halley's* Experiment above, and that the major Part of Sea-Salt is acid, and the major Part of Animal and Vegetable Salts are alkalous, I see no Reason why we may not think the Saltness of the Sea to proceed also in a great Measure from the washing down of the Fossile or Rock-Salts, either from thence, or after they have been brought into Use by Mankind; and of the same Opinion is Dr. *Plot*, who is confirmed by the Authority of *Pliny* and others.

But to proceed to the making of Salt; Dr. *Plot*, in his *History of Staffordshire*, tells us of some in the Parish of *Weflon*, where is made perhaps as good white Salt, as any in *England*, tho' not to so great an Advantage; for it yeilds but a ninth Part of Salt, whereas at *Up-wich* and *Middle-wich* it yields a fourth, and at *North-wich* and *Nampt-wich* a sixth; but with the Advantage of the Brine left in a former Pan, fifteen Hogsheads of Brine makes nine Strike of Salt, which is sixteen Hours evaporating away.

The Pit from whence this Brine is pumped is nine Yards deep and two Yards square; what comes from the Bottom is much the stronger in Saltness and Stink, and of a clearer Complection: And the Pans wherein they boil it are three, made of forged Iron, two Yards three Quarters long, and one Yard three Quarters broad; and their Fuel Pit-Coal, whereof, when their Pans are all kept going, they spend two Tons to a Drawing. During the Boiling, the Salt is cleared from Sand, of which there is some (at least *will be* after it has exhaled for some time) in all Brines whatever, which is thrown off towards the Corners of it, where are placed small square Iron Pans to receive it; this Brine, which is evaporating so long, yielding ordinarily from the five Fillings ten Pans of Sand, each weighing ten Pounds, in all one Hundred Pound of Sand, which is above one Fourth of as much Sand as Salt, allowing a Bushel of Salt to weigh about Fifty Pounds. About three Hours before the Evaporation is finished, that is, before they begin to draw (at the fifth Filling) they clarify the Brine with the White of an Egg; which being broken into a Bucket, and mixt both with cold and some of the hot Brine, is by the Motion of the Hand brought into a Lather, and gently sprinkled all over the Pan; whereupon there presently appears a Scum, that thickens by Degrees as the Impurities rise, which thus catched and detained by the Viscosity of the White of the Egg before the Brine boils again, is drawn over the Side of the Pan with a thin oblong square Board, fixed to a Staff or Handle call'd a Loo.

The Scum taken off, they boil it again gently till it begins to corn, which, to have to Desire, if they intend a large Corn, and have but little Time to let it corn by a gentle Fire of itself, they put into it about a Quart of the strongest and stalest Ale they can get; which corns it greater or smaller, according to the Degree of Staleness: Or if they would have it finer than it usually corns of itself, they either draw it with a quick Fire, which breaks the Corns small, or sprinkle the Surface of the Brine with fine Wheat-Flower, which makes the Salt almost as fine as the Sand which comes from it; which being very fine and white, it is thought may be of admirable Use in making of Glafs. But during the Time of its corning, they generally slacken their Fire, supplying the Furnace now rather with the Cinder of the Coal, (the smaller sort sifted from the Ashes) than the Coal itself; this giving the Brine a gentle Heat without Flame, and corning it better than

a forcible Fire, which breaks it small. Quickly after it has spent some Time in corning they begin to draw, *viz.* to take the corned Salt from the rest of the Brine, with their Loo, which they put into Wicker-Baskets called Barrows, made in a conical Form, and set the Bottom upwards, each containing a Bushel; through these, being set in the Leach-Troughs, the Salt drains itself dry in three Hours, which draining they call their Leach-Brine, and carefully preserve it to be boiled again, it being stronger Brine than any in the Pit.

The Draught of the corned Salt continues for about six Hours, and is performed gradually, the Salt-workers getting first about two Bushels, or Barrows-full; then by a gentle Fire they corn it again in half an Hour for the three first Pair of Barrows, but afterwards not under an Hour, the Brine being then thinner and the Pan cooler. They leave some Brine towards the next Filling; which, with the Addition of the Leach-Brine, heightens the weak Liquor, and much advances the following Operations. The Barrows being fully drained, are removed into the Hot-House, behind the Saltern to dry, and are set over the Brick Conveyance for the Flame, from under the Pans to the Funnel of the Chimney, (which Passage for that Purpose is made six or seven Yards long;) where after they have continued for Twenty-four Hours, the Salt will become so dry, that it is fit for Carriage or publick Sale.

This is the Process of making Salt in *Staffordshire*; which, tho' much more chargeable than in *Worcestershire* or *Cheshire*, where they spend not ordinarily above half the Time or Fire, of what the great Quantity of Brine they must use here necessarily requires for its Evaporation; yet its being always clarified with Eggs, and not with Bullock's Blood, as it is most commonly in *Cheshire*, (which gives the Salt an ill colour and Savour, and its being better cleared from Sand by long Boiling than either *Cheshire* or *Worcestershire* Salts) have given it the greatest Reputation.

Mr. *John Collins*, F. R. S. in his Book of *Salt and Fishery*, written *Anno* 1682. says, that the chief Brine-Pits for Salt are in *Cheshire* and *Worcestershire*, and that the chief in *Cheshire* are at *North-wich*, *Middle-wich*, *Nampt-wich*, of which *North-wich* excels.

There is in the Town one Pit, and five without, and all afford great Plenty of excellent Brine; of which is made Salt, pure, small, or big kernalled, heavy, hard and dry, that loseth little in Bulk, if well kilned or pressed into the Bag, which are the Qualities of the best Salt, and is there sold at Six-pence the Bushel. The Town-Pit is more conveniently situated than the rest, being within five or six Miles of *Fratfome* Bridge, where it is laden for *Ireland*, and a River comes thro' the Town that might be made navigable. At *Middle-wich* are Seven Pits or Brine Sheaths, which yield great Plenty of most rich Brine. At *Nampt-wich* is one within the Town and two without, and are sufficient to serve the fourth Part of the Nation, altho' it is weaker than the other *Wiches*, in which some will turn to Salt in an Hour's Boiling; whereas at *Nampt-wich* the Pans are twice or thrice filled, and boiled down. Leaden Coolers have been made to put the Salt in, as it came out of the Pans, where it would dry, harden and become big-grained.

It is Mr. *Collins's* Opinion, that in *Cheshire* and *Worcestershire*, with Skill, Cost and Labour, there may be more Salt made than can be spent in the King's Dominions. He says, that at *Nampt-wich* they boil it in Iron Pans, about three Foot Square and six Inches deep; their Fires are made of *Staffordshire* Pit-Coals, and one of their small Pans is boiled in two Hours. To clarify and raise the Scum, they use Calf's, Cow's and Sheep's Blood; but this gives the Salt an ill Savour, as I presume any Blood will do: And it is by its Viscosity, like Whites of Eggs, which makes the Filth stick to it, and get together in a Scum; and the Blood was used only for Cheapness-sake.

About *Droyt-wich*, within four Miles of *Worcester*, are many Salt-Springs; and from one in the great Pit at *Up-wich*, is made four Hundred and fifty Bushels of Salt in every twenty four Hours; it is so strong, that the fourth Part is Salt. They use Leaden Pans five Foot and a half long, and three Foot wide. Their Fuel was formerly all Wood; but since the Iron Works in the Forest of *Dean* have destroyed that, they now use Pit-Coals.

The Salt-Springs are very cool at the Bottom, and not to be endured by Men above half an Hour, tho' they be well warmed with much strong Liquor; however, it never freezeth. To prove this Salt better than others, Mr. *Collins* says, it will dry in four Hours; and keep so three Quarters of a Year; that none is whiter and freer from Dross; and a *Winchester* Bushel weighs half an Hundred; that in the same Quantity it makes Meat saltier than *French* Salt: But I conclude this must be from its being freer from Dross, and so there is more Salt; and its having a smaller Grain, which makes it dissolve sooner. Herrings have been salted herewith, and have been whiter and better tasted than with Bay Salt

Salt. It is ordinary to salt Beef but once to keep a Year; and its common with all barrel'd Beef to do so.

They have a Sort called Clod-Salt, digged from the Bottom of the Pans with a Picker being the strongest, and most used for Bacon and Neats-Tongues; it makes the Bacon redder than other Salt, and the Fat eat firm. Some say this Salt is best for Cheese, but it is accounted too strong for Beef; perhaps because it is a large Grain, and penetrates by degrees, which is equivalent to an often Salting. With the finest white Salt they make Loaves like Sugar-Loaves, which will keep dry without Fire; but it is otherwise at *Namptwich*, I presume from a different Management.

As to Salt made by boiling of Sea-Water, the want of Brine-Springs near the *Eastern Coast*, and the Dearth of Foreign Salt, necessitated the making of Salt at *Shields*, and *Bishop Weremouth* in the Bishoprick of *Durham*. The Pans here used are made of wrought Iron, of eighteen or nineteen Foot long, twelve Foot broad and fourteen Inches deep, and boiled with Sea-Coals. At Spring-Tide they let the Sea-Water into Ponds, from whence it is pump'd into their Pans, which are six or seven Times filled, and half or more every Time boiled away, before it becomes Salt.

When great Freshes come into the Rivers *Tine* and *Were*, they take no Liquor; neither need they, for they make as much Salt in Six Months as they can sell in *Twelve*. Of late they boil their Salt better, and make it harder than formerly; for this Salt hath had a bad Repute, by being moist and apt to run to Water. The Sum is, that with good Care it will serve for most Purposes, and is found peculiarly good for Hung-Beef and Bacon.

Salt made from Brine rais'd by the Sun, &c. is made at *Limmington* in *Hampshire*, not far from *Portsmouth*, in an Island called *Portsea*, from whence the Salt hath its Denomination. The Place where this Salt is made, is called a *Salt-Work*; and in it is to be considered, First, the Quality and Situation of the Ground; Secondly, the Banking or Recovering the same; Thirdly, the making of Brine-Pans, and in them Brine by the Sun's Exhalation, with the Manner of doing thereof; Fourthly, the Boiling-Houses, Grates, Iron-Pans, and the Art of boiling Brine into Salt.

For the Quality and Situation of the Ground, it ought to be a Sea-Mud, Oase or Slecch, overflowed (if it may be) at the lowest Spring-Tide three Foot; and then the highest will be sometimes twelve or thirteen Foot. The Reason of such Overflowing is, that there may be made Feeding-Ponds with Walls of Earth, to keep Sea-Water in of any Dimensions, two Foot in Height one above another, so that the lowest may be filled by a little Sluice in the Bank, at the lowest Spring-Tide, where this (which is called Stay-Liquor) will improve by the Sun and Wind before it be transmitted into the shallow Brine-Pits, on lower Ground. These Ponds are furnished with Mulletts, Plaife, Flounders, Eels, and other Fish from the Sea; where they increase incredibly, and exceed both in Goodness and Largeness fresh River Fish of the same Kind. If convenient, there may be also Oyfter-Pits.

The Ground must be strong Sea-Mud, like Clay, that will retain Liquor. This Mud ought to be eight or more Feet, for making of Ponds call'd Cisterns, to keep Brine in, without soaking away, after it comes from those Pans called Sun-Pans, where it is made strong, and transferred into these, to grow more mature with Age. Here the Brine may be impaired with Rain-Water, but that will swim uppermost, and the Brine may be pump'd from the Bottom, if the Bottom of the Pump be fastened into a Basket.

If one of these be covered with a Tiled-Roof, it is called a Brine-House, to retain Store for Winter-Boiling; and Tiles are better than Thatch, because its Straws will fall into and discolour the Liquor. The Sides and Ends of the Brine-House ought to be Posts of Timber, with Hurdles behind, the Ground being such as will not imbibe the Liquor.

If the Ground do not admit the Depth above-mentioned, Cisterns are to be made above-ground, into which the Brine must be pumped or laved; which the Workmen, in wet Weather, are apt to decline, to the Loss of much Brine. But in the uncovered Cisterns the Brine will freeze, and therefore ought to be removed. In the Tiled Brine-House it freezes not.

The best Situation for a Salt-Work, is where there is most Sun-shine, and the Wind has freest Access, near a Coal-Mine or good Turf; however, not far from such Place where Coals may be landed, and Salt exported. If Ground might be had to With, it should be a Rising Ground, with a Channel in the Middle: Then with Banks three Parts round, high and strong enough to keep out the highest Tides; both from the Sea and Channel may Ponds be made with low Banks; and tho' the Water, by Sluices, be let in from the Channel, and out from the highest to the lowest at Pleasure, and be the easiest Charge.

If it be in a Salt-Water River, Land-lock'd, it will be much the better; for lesser Banks will serve, and they will endure better. Near the Channel, in the Middle, may be made a Key, whereon to land or ship Goods; athwart which should be a Sluice with strong Gates, whose Hinges open Sea-wards, to carry off Freshes, and to keep Sea-Water out: And other Gates may be made towards the Land, to draw up with Windlasses.

Banking and recovering the Ground is performed by the Aid of Gin-boats, to drive into the Mud, Rows of Trees, and Posts sharpened at the lower End to shape out a Walk. These Trees to be bound together long and broad-ways, like the Ribs of a Ship, with Flitterns, or Pieces of Oak, or Cross-Bars; and after good store of Stones have been thrown into the Middle, and Parts adjacent to the Channel, where these Trees ought to be thickest and longest, the same to be boarded up, and the Whole filled when it shall be fitting, with Stones, Gravel, Clay, &c. which will force the Mud out on each Side, and make a Declivity; which Sea-ward, may be hardened with Gravel to become a narrow Walk, wherein to stand to drive Stakes, whereto to fix Hurdles or Hedges, which will be filled with Sea-Weeds, and much defend the Bank from being washed down by the Waves.

After a Summer or two the recovered Mud will be dry, with Cracks which must be filled with Earth, and reduced to Feeding-Ponds, and Levels for Brine-Pans. This Mud will make excellent Bricks, and Soil for Lands; but what is designed for Tillage and Pasture must be deep ploughed and harrowed, that Rain-Water may not wash the Salt out; or it may be cured with Lime or Marle, which makes it admirably fertile, and a very good Compost to improve barren Ground.

Mr. Collins gives the Manner of making Brine-Pans and Brine; also of Salterns or Boiling-Houses, Grates, Furnaces, and Iron Boiling-Pans, &c. of all which I have said something in my *Cheshire Salts*; and if more be desired, I refer you to his Book, or the Places about *Portsmouth*, &c. where all may be seen.

Salt upon Salt is Sun-made Salt, boiled up with Salt-Water, and cleared from Dirt, Sand and Bittern; and this is allowed to be good for all Intents and Purposes. Salt upon Sand is only Salt-Water-Sand washed and boiled to Salt, made by them that know not how to do better. The Chymists say, Rain and Dew will yield a Salt, and have given the Processes of making it; and it is reasonable enough that their coming through the Air, should bring some of the Nitre with them.

Mr. Collins mentions divers Instances of fertilizing Land by Salt, tho' antiently some Cities were cursed by sowing of Salt; and undoubtedly, discreetly used, it is excellent Manure; *i. e.* in too great Quantity it kills, in lesser fertilizes.

Dr. Wood tells us, that several Plants as well as Fish thrive well in Salt-Water; but where he speaks that Dung fertilizes, *ergo* Salt, he misunderstands his Subject; for the Salt of Dungs is a quite different sort of Salt from *Fossile* or *Marine*. He gives several Instructions about the moderate Use of Salt in fertilizing Land, which is certainly right; but still speaks of my Lord Bacon's applying Fertility to Salt, as if he meant *Marine* Salt.

Not but that it is very reasonable to suppose from Experiments that have been made, that even *Fossile* or *Marine* Salts have much of the Nature of *Nitre* in them; that is to say, they in some degree cause a *Ferment*, which is a Help to Vegetation: They set in Motion the earthy Particles, or proper terrestrial Matter, which by the Help of Heat and Moisture are conveyed thro' the Vessels of Plants for their Nourishment and Increase. This may be gathered from the Effects of Sea-Sand (and the salter and wetter it is the better) laid upon Land as a Manure: The Sand dispersing *equally* the saline Particles, (and not suffering them to lie in Heaps, which would prove fatal) surprizing Products even from worn-out Land have been observed to follow; for which Reason it is that I have warmly recommended this Practice to those who live within a few Miles of the Sea.

Brining of *Wheat* (now grown very common) is found good by Experience to prevent Smut, Vermine, &c.

Of QUARRIES, &c.

IN many Parts of *England* there are Plenty of Quarries of Stone, &c. for Materials for Building, and Fences for Walls, dug in the Earth, as well as Mines of Coal, Oars, &c. And the chief of these Quarries, for the Product of beautiful Stone, is in the Isle of *Portland*; tho' there are few Lords of Manors, especially where there is a Scarcity of Timber and Wood, but on their Lands may dig Stones fit for any common Employment; so well is Nature stored with what is necessary for the Conveniencies of Life, in this our Island.

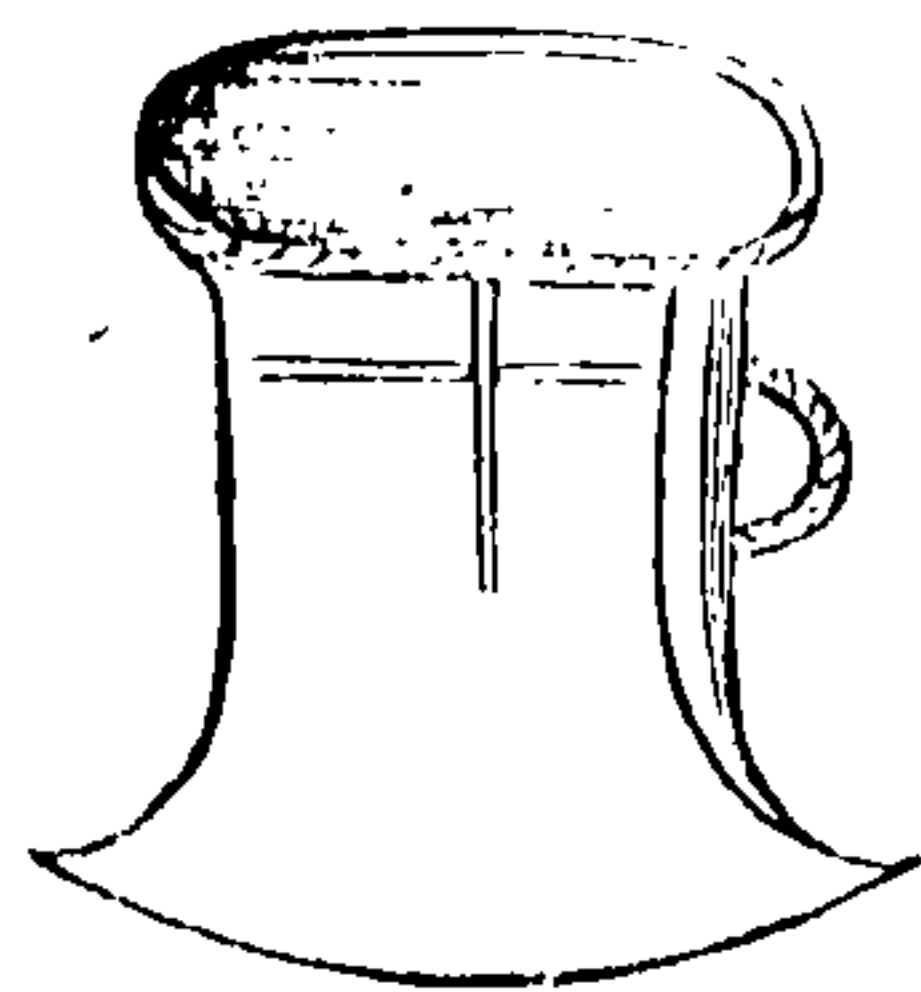
Near *Chatsworth*, in *Derbyshire*, the Seat of his Grace the Duke of *Devonshire*, there is a Piece of Ground call'd *Haddon Pasture*, so rich for its subterraneous Products, that as many Shillings have been offered for it, as lying flat would make a Border round it; which was refused, unless they would set them *edge-ways*; and some think that would have been a good Bargain. The Pasture of this Ground is extremely rich; and besides a rich Oar within less than a Yard of the Surface, and store of Iron Oar; here are extraordinary Quarries of Mill-stones that serve most Part of the Kingdom, and they are worth eight, nine or ten Pound the Pair, and Grind-stones of all sorts, from five or six Foot Diameter and under, and Scythe-stones in abundance. There are also Quarries of Free-stone, Alabaster and Marble; of which as curious Works may be made as the World affords.

There is also Store of Lime, which makes as good Mortar as can be used; and Critch-Lime is carried up and down for Whiting, being as pure as any Chalk: There is likewise great store of Plaister, which being burnt and thrashed to Powder, (to which it burns with ease being new) and this being well wrought with Water, and spread on a Floor, in a few Days will be as hard as Brick, and may be made as smooth as Glass; but the Floors are commonly made part of old and part of new Plaister, and the new alone is used for drawing a thin fine white Coat over the grey, (*viz.* old and new beaten together) and if this prove to be curiously burnt, neither too much nor too little, it will continue a firm Floor for Hundreds of Years, tho' constantly trod upon, and will be safe from all Danger of Fire; but if it be *too much* burnt, then it will be more soft when the Floor is cast, and will sweep up in a short Time, unless extremely water'd, which sometimes recovers it; and if it be *too little* burnt, then it cannot be thrashed to any purpose, so that the Floor will have Lumps, as if it was full of Stones, which will be the ruin of it; so that you are under a Necessity of avoiding these two Extremes in the Use of this Flooring.

This Account I have mention'd, to shew the Treasure of the Earth; and there are many Places in this Kingdom, that are extremely rich in their Products of Mines, Quarries, &c. as well as *Haddon Pasture* above described.

For as I have Reason and Occasion often to observe the wonderful Provisions of Nature and Riches couched in the Bowels of the Earth throughout the Bishoprick of *Durham*; so here it cannot but be observed with Gratitude, that hardly any one valuable Treasure ordinarily found scattered in some other Parts of the Kingdom, but it is found in some measure here, and in most sorts a vast Plenty; and that (which is no inconsiderable Circumstance) generally within a small Distance of a navigable River. The inexhaustible Mines of the best Coal in *Europe* (of which more presently) is an immense Treasure, as they bring Riches, not only from our own Ports, but from all the neighbouring Kingdoms. Free-stone of all sorts; some as fine as that from *Portland*, fit for the best Floors, Walls and Chimney-Pieces, is found in great Plenty even on the Banks of navigable Rivers; not to mention the best sort of Fire-stone, Grind-stones, Mill-stones, but especially Lime-stone; of which more in another Place. At *Penchy-Hill*, three Miles from *Sunderland*, there are three remarkable Treasures couched in its Bowels: On one side is found Coal at an easy Depth; on another side is found excellent Lime-stone, and on a third side great Quantities of Free-stone for Building, all within one Hundred Yards compass. Thus are seen together Stone and Mortar, growing as it were out of the Bowels of one little Hill.

To say nothing here of Lead, Iron, &c. which hath been spoke of separately, I cannot forbear mentioning one remarkable Thing lately found in the Bowels of the Earth, even in my own Glebe at *Bishops W'remouth*, where the Quarry-men digging for Lime-stone, at least ten or twelve Foot Depth of solid Rock, found, to their great Surprise, amidst the small Joints and Crevices of the Stone, three Pieces of Cast Metal hard almost as Steel, and yet resembling *Bell-metal*, in the Form here annex'd; Two of them much bigger than the *Third*, hollow within, and perfectly sharp in the Edge. It is hard to say how or when they should come there, as of what Use they could be; except, having Sockets, they should be used as offensive or defensive Instruments in War.



According to the foregoing Conjecture, having shewed the Curiosity to some connoisseur in Medals, and other curious Pieces of Antiquity, I find it is generally agreed to be a sort of *Cuneus*, or Battle-Ax, which the *Danes* brought over amongst us in great Quantities; which, it is probable they put on the end of their Spears *occasionally*, as rather defensive Weapons to keep off the Horse from annoying and disordering the Foot Soldiers. Whether this Conjecture be right or no, I know not; but I have been told by an ingenious Gentleman in the Herald's Office, that there are several of them found in many other

Parts

Parts of the Kingdom, in much the same manner as before related, even in the Caverns of the Earth, and very deep amongst the Clefs of the Rocks, most frequently lying on Heaps in Numbers, sometimes twenty or thirty of them together.

It is here to be observed, that hard Rocks have not a *cleaving* Grain as soft ones have; and therefore when they are minded to break up the Stone in such Quarries, they use great heavy Stone Axes, with which they work down a deep Channel in the Stone; into which Channel, at the top they lay two Iron Bars, such as Smiths have from the Forge to work out, and so they drive Iron Wedges between these Bars to break off the Stone; for their Wedges will not go where there is not a Channel made for them, as they will in soft Stones.

But then again, that which in some Quarries cannot be effected without much Time and Toil, as well as an extravagant Expence, by the help of divers Tools and Instruments, such as Mauls, Pick-Axes, Wedges, Leavers, &c. is in other Places readily performed with less Charge and Trouble, by making a small Perforation into the Rock, which may reach a pretty way into the Body of it, and have such a thickness of the Rock over it as is thought convenient to be blown up at one Time. For at the further end of this Perforation a convenient Quantity of the best Gunpowder is placed; and then all the rest of the Cavity being filled with Stones and Rubbish strongly rammed in, (except a little Space left for a Train) the Powder by the help of it is fired; and the impetuous Force being hindered from expanding itself downward, displays its Strength against the upper Parts of the Rock, which cracks it into several Pieces, most of which, with no great Difficulty, submit to the Strokes of the Workmens Hammers; and thus, by the help of a few Barrels of Powder, employed in this manner, many Thousand Tons of Stone have been obtained out of a common Rock.

But notwithstanding all this, it should not be dissimbled, that this Matter of blowing up Rocks, of *Lime-Stone* especially, is by no means brought to that Perfection one might have expected from the Force of Powder; at least to have it done in such a manner and measure as to answer the Charge: Of which I have an experimental Knowledge in my own Glebe, where I have vast mountainous Rocks of Lime-Stone, lying with little Earth upon them, and bedded in large Pieces with few Seams, in perpendicular *Strata* about fifty Foot deep. On these have been several Attempts made by Gunpowder, the Rock being first bored *perpendicularly*, and the Powder ramm'd and fastened in by proper Plugs; but yet the Fraction always proved too inconsiderable for the Trouble and Charge; which has discouraged further Attempts that way: However, it seems rational to hope, that if a Contrivance could be made at the bottom of the Rock, where it is excavated, to bore an Hole *horizontally* into the most solid Part, and to make a Cavity within much bigger than the Orifice to receive a Quantity of Powder, the Earthquake and Dissolution, as well as the Advantage accruing thereby, might be very considerable. This is what I propose, some time or other, to try and improve, if possible; and in the mean time, for my own sake, as well as the good of the Publick, shall be glad if any ingenious Person skilled in the Force of mechanical Powers, would communicate to the Publick his Thoughts on this Head. I have been lately assured, that they constantly and solely use this Method of Gunpowder in the West of *England*, tho' I have not been able yet to obtain an Account of their Art.

Of COALS and COWKE.

OF Coal we have abundance in *England*, more perhaps than in any other Part of the World, dug out of Land, to the very great Profit of the Owners of the Soil. Coal is thought to be nothing else but Bitumen indurated by Time and subterraneous Heats.

There is a sort of *Cannel Coal*, of so close a Texture, that it will take a tolerable Polish; and the Choir of the Cathedral Church of *Litchfield* is in a great part paved Black and White, with *Cannel Coal* for the Black, and *Alabaster* for the White; and when kept clean, it appears like Black and White Marble. It turns like Ivory into many pretty Utensils, *Ink-Boxes*, *Candle-Sticks*, &c. This Coal is dug in the Park adjoining to *Beaufort*, belonging to the Lord *Paget*, about thirty or forty Fathom deep, lying between other Beds of a softer Kind, and is the best in *Staffordshire*, or any where else; except in *Lancashire*, which it is said has no Grain, and therefore not cleaving as this will do; upon which account it is preferred for making such Utensils as above.

The chief Use of the *Staffordshire* Coal is for Firing, wherein those who use it observe the Grain of the Coal; for if they would have it burn *slow*, they lay it flat-ways upon the

the Fire ; but if *clear*, it is set edge-ways, and then it burns as light as a Candle. The Coal dug at *Hanley-Green*, near *Newcastle*, *Under-Line*, is much softer, and of much more sensible Plates, which appear to the naked Eye when the Grain of the *Cannel* will not : Wherefore this is no more capable of Politure than common Coal, yet it is more gay to the Sight, and it burns swift ; and therefore better for Smiths than Kitchen-Fires, tho' not so good as Sea-Coal.

These last are best supplied by the common Coal of the Country, especially that of *Dudley*, *Sedgely*, &c. which some prefer to the *Cannel* itself ; the Texture and other Qualities thereof being such, that it is a fat shining Coal, having a pretty open Grain, lying seldom in a Level with the Plain of the Horizon, (which indeed is the Case of all Veins of Coal throughout *England*) but most times *inclining* to it, (according to which it cleaves into Blocks at the Discretion of the Workman) that it burns away with a sweet white Flame, and into white Ashes without Cinder. Of this sort there is great Plenty in all Parts of the Country, especially the Places abovesaid ; that most commonly there are twelve or fourteen Collieries in Work, and twice as many out of Work, within ten Miles round ; some of which afford two, three, four, or five Thousand Tons yearly, the Upper-Beds above the Iron-Stone lying sometimes ten, eleven, twelve or fourteen Yards thick ; so that some Acres have been sold for 100 *l.* each, and one for 150 *l.* and from one Shaft hath been drawn five Hundred Pounds worth of Coals.

In the Forest of *Kings-Wood*, near *Bristol*, are very considerable Collieries ; which not only furnish that large City with Firing, but also the whole Country : In *Wales* there are also Mines of Coals ; and on *Mendip Hills* in *Somersetshire*, there are great Plenty of Coal-Works, and almost all other Mines.

But that which calls for our greatest Regard and Notice in this Article of Coals, is the surprising Quantity of them, and the ingenious Method of conveying them to the navigable Rivers in the Bishoprick of *Durham*, and the Parts about *Newcastle*. As far as appears to the contrary, there is no doubt to be made but these Treasures lie hid in the Bowels of the Earth, in some Places shallower, in others deeper, almost all over the County of *Durham* ; and it is not uncommon for the Miners to sink fifty, sixty, and seventy Fathom in search of these Riches ; which, when found, by the Contrivance and accomplish'd Skill of the Owners, are with great Expence made to answer the Purposes of getting vast Estates, of employing great Numbers of poor People, and furnishing all the Sea-Ports in *Europe* with vast Quantities of excellent Fuel, but especially the City of *London*, which would otherwise remain under a miserable Degree of Want.

That vast City is almost wholly supplied with these Coals, and (were it not for the Duty laid on them) at a very easy Expence : Which Expence is yet made heavier by a certain Number of Men in *London*, called *Crimps*, who monopolize them, and engross the whole Market in the Summer, and set their own Price in the Winter on those who are forced to buy them.

Those who are acquainted and are conversant with the Collieries, know there is great Difference in the Goodness of them. There are what they call *Three Quarter* and *Five Quarter* Coals, which are the first and easiest come at ; but that they call the *Main Coal* is what lieth deepest, and is every where accounted *best* ; and they are such as are almost universally sent abroad to Market ; and the other are sold cheaper at home. But there is also a Difference in the Goodness of these, though the Monopolizers at *London* make none, when they mix them all together ; and even the *best*, which are sent out of the Bishoprick, are all called *Newcastle Coal*.

It is to little Purpose to mention the several *Strata* or Veins of Earth, thro' which they dig before they come at Coal ; because these are different in different Places : But in all of them there are vast Varieties ; and sometimes they meet with Rocks of Stone almost impenetrable, the hardest of which they do however overcome with Gunpowder, or with continual Labour. But the greatest Annoyance, and hardest to be overcome, is *Water* ; which often pours upon them from *Bags* and unforeseen Currents, and would destroy all at once, if a seasonable Remedy were not applied. The Method of which, as it is now used and much improved by the polite Men of the *North*, is one of the greatest Instances of the real Use of Philosophy and Mathematicks to Mankind rightly applied.

The *Engine* or Contrivance for drawing Water by the help of Fire, is the ingenious Invention of the late Mr. *Savory*, F. R. S. which Mr. *Bradley* has curiously delineated on a *Copper Plate*, and particularly described the Nature and Method of its Operations : But as it is now grown into more common Use, is so thoroughly well understood, and so much improved, especially in the *North*, of late Years, I shall say little more about it here, except what is to my present Purpose, *viz.* That this *Fire-Engine* is now successfully used,

not only to clear the Pits of Water, whilst the Coals are winning; but also as an Instrument to rid them of all Water, even whilst they are Sinking, by moving the *Sucker* or *Pipe* from one side to another, as they go down Step by Step; which not only saves a great deal of Charge, but makes great Expedition. Of the Uses and Application of this Engine may be found a full Account in the Inventor's Book call'd the *Miner's Friend*.

The Charge indeed first of *making*, and afterwards of *working* the Fire-Engine, is very *considerable*, and would any where else but in a Country of Coals be *insupportable*: But *here* it is to be taken Notice of, that the *Engine* works its own *Life*; and whilst it removes the Water, it helps at the same to procure Coal; which gives it *Breath*, and sets it in Motion. However, the Consumption of Coal being very great, hath of late put some upon Trials to effect the same thing by the *Air* and its elastical Power; but this being one of those Things which are *true* in Theory, but *false* in Practice, it is found by Experience not to answer; by reason the Discharges are too slow, and not frequent enough to remove the Load of Water to be discharged.

But, besides the Ingenuity used in applying the *Powers of Nature* for the gaining these Coals, *mechanical Powers* are also used with no less Art for the conveying these Coals to the several Parts of navigable Rivers. For the *Waggons* and *Waggon-Ways* are so curiously contrived, and so rightly adjusted, that one Horse is able to draw Four Thousand Five Hundred Weight of Coal at Four Miles Distance, and to go backwards and forwards four times in a Summer's Day. The *Waggon-Ways* are contrived and made to be as near an horizontal Level as is practicable, and to run with two parallel Lines made of Oak Spars, kept steady by cross Pieces; and at the exact Distances of the *Waggon-Wheels*, which press upon them, not in an exact Plane, but a little *obliquely*, the better to keep them in their Places. The *Waggons* are made square and tall, wider at the top than at the bottom, and are carried by four Wheels, of about two Foot diameter, made of solid Oak.

But because *Wood* pressed upon by *Iron*, would quickly wear out, therefore the Wheels are not *shod*, except sometimes in such Places where there is found some Decay. On which account however, the *Motion* being sometimes violent, and the *Friction* very great, there is found some Hazard of the Wheels being set on Fire. To prevent which, and the violent Motion on every little Declivity, they are forced to take out the Horse, and to let him *follow*; and to make the Friction fall in more Places than one, as well as to hinder too violent a Motion forward, there is also a Contrivance of a strong Piece of Wood fixed on one side of the *Waggon* on a Centre in the middle, called a *Convoy*: Which *Convoy* in the Hands of the Governor is pressed upon more or less, like a *Leaver*, and is so contrived as to occasion the other end to press on the edges of the Wheel; whereby a greater or lesser Friction being made, the Motion of the *Waggon* is regulated as Circumstances and Necessity require.

After the Coals are thus with safety *convoy'd* to the *Steaths*, or Keys by the River-side, where they are to be unloaded into the Keels, *here* also there is no less Ingenuity and Mechanism used for Dispatch and Expedition; for the *Steaths* being made in the Form of wooden Bridges, the Horse by an easy Ascent draws up his Load to the top, which is sometimes twenty Foot above the Surface of the Water. *There* the Horse is loosed, and the loaded *Waggon* by one Man is moved into its proper Place designed for unloading; the Foundation whereof being contrived to turn altogether upon a Centre, the Whole is turned *half round*, and by pulling a Board out of the bottom of the *Waggon*, the Coals immediately tumble out into a Spout, which conveys them next way into the Keel lying in the River. And although, as I said, each *Waggon* contains no less than Forty Four, or Forty Five Hundred Weight, they are all emptied into the Keel in less than half a Minute. The Reason of the *Waggon's* being turned *half round* upon a Centre is, to put it into a Posture of going off empty on another Frame of Wood side-ways. By this Means there is a constant Succession of loaden and unloaden *Waggons*, from Morning to Night, coming and going without any Interruption.

I have been the more particular on this Head, that People in the *South*, who are apt to entertain strange and monstrous Opinions of the *North*, as if it wanted both Sun and Sense, as well as the Necessaries of Life, may form right Ideas of Men and Things: For if Trade, and Riches, and a Multitude of People; if Plenty of the Comforts and Conveniences desirable in Life; if the Improvement of ingenious Arts and Sciences, and a polite and elegant Way of Living and Converſing: If all or any of these are real Indications of the Beauty of any Country, or the Wisdom of any People, this Part of the *North* makes a pleasing Discovery of them all. It may be *envied*, but with Knowledge it cannot be *pitied*.

But yet as Rich and as Polite a People as are here ordinarily to be found, I have often smiled with my self to think, that the Riches and Trade of this Country are supported and maintained chiefly by three seeming *Absurdities*: For in the Business of the Collieries, it so happens, that they are sometimes *drowned for want of Water*; you frequently see here the *Cart before the Horse*; and almost every Day in the Year they *carry Coals to Newcastle*. The *First* case happens in a dry Summer, when their *Feeders* fail them at the Fire-Engine; the Rivulet that should supply the Engine with Water, hardly conveys enough to keep it working, whereby the Water in the Pits is in danger to get Head of them. The *Second* is every Day seen, when the Coals are going down-hill; they are forced to take the Horse out, and let them *follow* the Cart, which of itself, tho' loaden, goes upon the Frames fast enough (sometimes too fast) when there is any considerable Declivity. The *Last* needs no explaining.

Cowkes are the Cinders of Coal, made in the following manner: The Collier sets six or eight Waggon-Loads of Coal in a round Heap upon the Ends, and as Pyramidal (*viz.* large at bottom and small at top) as they will stand.

If it be a windy Season, he sets Fleaks to shelter it; and then into a Hole left in the middle to the top of the Heap, or Pit as they call it, he throws a Shovel full or two of Fire, which by spreading itself each way fires the Pit round; this burns and blazes till the Smoak and Flame ceases, and it is all of a red Fire; then he covers all the Heap with Dust, and that side first which by the help of the Wind burns most, or where the Fire first breaks out, which immediately damps it and makes them dead Coals, which thus stand till next Morning, or longer according to the Occasion; and then with a Rake, like a Gardener's, having six or eight Teeth, he pulls them down round the Heap, and the Dust falls to the bottom, which is thrown up on a Heap to damp the next Pit.

It is observed, that three Hundred of *Coals* make but one Hundred of *Cowkes*, and the lighter they are the better; if they are curiously burnt they will gingle like common Cinders, and a Sack of six Bushels will weigh about one Hundred Weight.

The reason of the *North-Country* Pale Malt being so fine and sweet, is imputable to the drying it with *Cowkes*; and it is not much above half a Century of Years, since the Malsters at *Derby* dried their Malt with Straw (as other Places now do) before they used *Cowkes*, which have made that Alteration since, that all *England* admires.

Other Countries have as good Bailey and Malsters as *Derby*; but for want of these burnt Coals, the Malt that is made is much inferior to what is made *there*, and in the other Parts of the *North*, with the *Cowkes* above-mentioned.

OF BRICK-MAKING.

BRICK-Making is a great Improvement of the Profits of Land: And there are chiefly two sorts of Bricks, *viz.* *Stock-Bricks* and *Place-Bricks*. The first are strongest and hardest, made of Hazel Mould or Stiff Loam, nine Inches long, four Inches and a half broad, and two Inches and a half thick. The Earth is dug about *Martlemas*, and tempered about *Lady-Day* following; after which it is made in a Mould, attended with a *Water-Trough*, *Sand*, a *Strike*, and *Pallate-Boards*.

The Earth being prepared, is moulded like Dough, and sanded like Flower, and laid on a *Bark* edge-ways; and when pretty dry, another Course is laid cross them, and so for ten Courses, then covered with Straw till dry. They are in new Ground burnt in a Kiln; but afterwards the *Clamp* is covered with burnt Bricks.

There are usually employed about a Stool's Work, four Men and two Boys: The first, an *Earth-Maker*, that prepares the Earth: The second, a *Carter*, to bring the Earth to the Stool: The third, an *Up-Striker*, a Boy, that lays the Earth upon the Table, and cuts it out for the Moulder: The fourth, the *Moulder*, who makes the Bricks in the Mould: The fifth, an *Off-Bearer*, a Boy, who carries the same in the Mould, and lays them abroad upon the Ground: The sixth, an *Up-Ganger*, who a Day or two after, as they become stiff, takes them up, and sets them in Wind-Rows to be dried; and when they are enough dried, they are to lay them in the Kiln for Burning.

A *Stool* does ordinarily make (if the Men work by the Day the usual Hours) *Six Thousand* a Day; but if the Men work by the Great, beyond their usual Hours, they will make *Eight Thousand* Bricks in a Day. One Man, without Help, will make a Thousand in a Day; but with a Temperer and Boy, two or three Thousand, &c. The six Persons employed have but three and twenty Pence the Thousand; the Moulder, five Pence; the

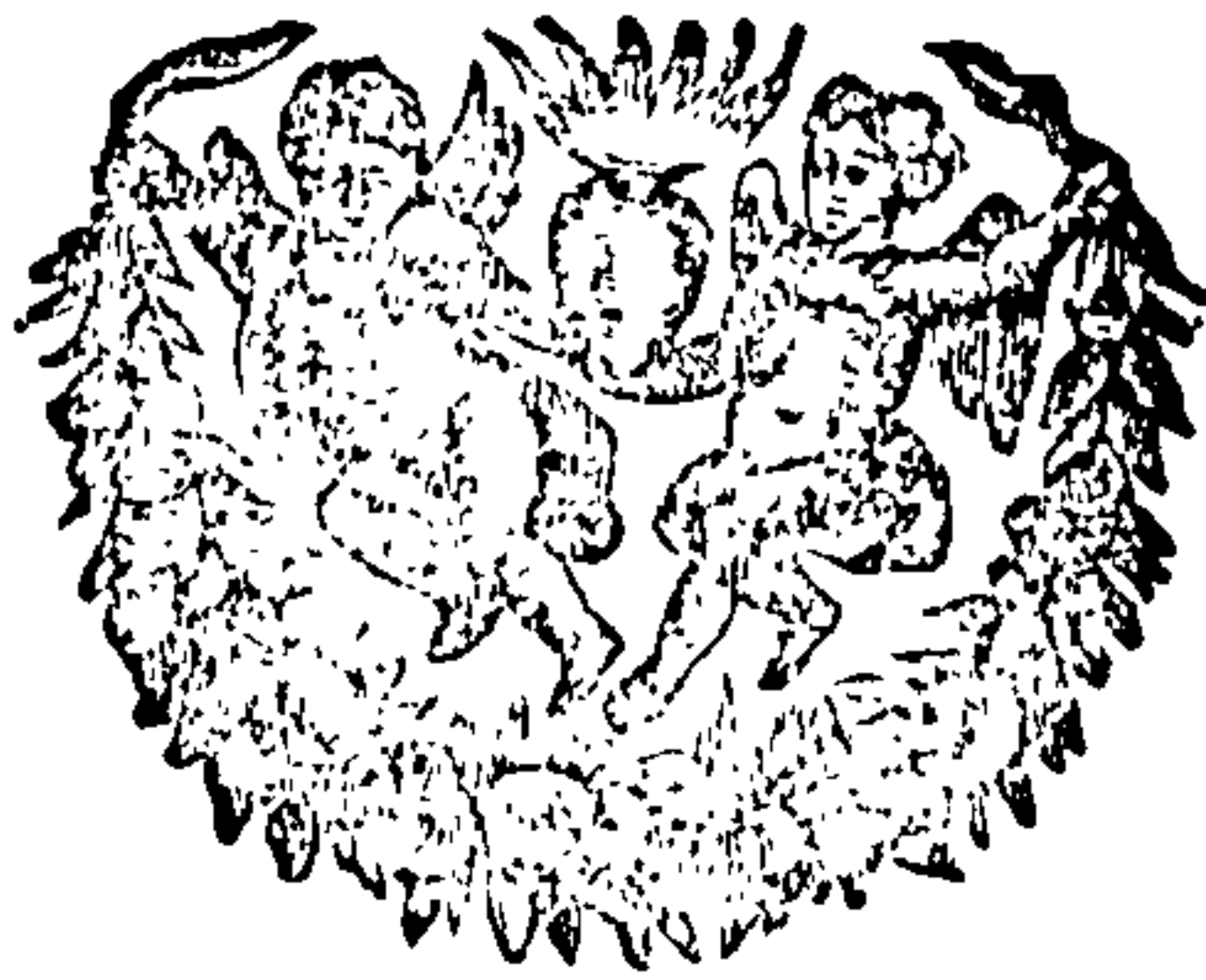
Earth-

Earth-Maker, Carter, Off-Bearer and Up-Ganger, four Pence each ; and the Up-Striker, two Pence.

A Piece of Ground of ten Spades, which is about thirty three Foot square, will make an *Hundred Thousand* of Bricks ; and the Digging it amounts to One Pound five Shillings, which makes it three Pence the Thousand. Two Hundred Thousand of Bricks, made to be burnt in one or two Clamps, will require about four or five Loads of Wheaten Straw ; (tho' Rye Straw is esteem'd better than Wheat, because it is tougher, and will bend and carry off Wet better ;) and the Expence of Straw is much the same as Digging. Of Coals, about a *London Chaldron* goes to every Ten Thousand of Bricks ; and so Ten Chaldron to One Hundred Thousand : But some say, Five Chaldron will serve ; and that Ten Load of Straw will be sufficient for Ten Hundred Thousand Bricks. The Cost of Coals, by the first Computation, comes to about Twenty Shillings the Thousand Bricks, but much cheaper still where Coals are plentiful.

A Load of Sand serves for Six Thousand Bricks. In *Russia*, 'tis said they use Sun-burnt Bricks ; and Mr. *Houghton* says, a Gentleman of *Bedfordshire* did the like to good Purpose. Powder of Bricks is good for several Uses, particularly for scouring of Metals, and some use it for Manure ; the Reason whereof is, that by the Fire it is made porous, and so fitted to imbibe the Nitre or *Spirit* of the Air, by which means it opens and relaxes, and so fertilizes the Earth.

Tiles are made with somewhat finer Earth than Bricks, better tempered and harder baked.





A
NEW SYSTEM
OF
AGRICULTURE
AND
GARDENING.

BOOK II.

CHAP. I.

Of the several Sorts of Forest and Timber Trees, great and small, Ever-greens, and flowering Shrubs, such as are found to grow in England without Housing, shewing their Nature, Use and Virtues.

THE great and sensible Decay and Want of Timber for these late Years ought to inspire every generous Spirit and Lover of his Country with a Zeal and Passion for *Planting*, that may give him a more comfortable View, and such as late Posterity may bless and praise him for. The Avarice of some and the real Wants of others, have of late Years strangely impaired the Riches of the Forest. And I doubt it is still a growing Evil, such as may in Time have a very Melancholly Effect on our Navy, which hath been ever thought the
N n Glory

Glory as well as the envied Bulwark of these Kingdoms, if not some way or other put a Stop to. The Timber of an Estate, either dip'd or mortgaged, is the first thing that the imprudent unthinking Heir lays his hand upon, as what is to bring him in *ready Money*; not so much perhaps to pay his Father's Debts or Sisters Portions, as to supply him with *Tools* for Gaming, and *Necessaries* (as he calls them) to support his Luxury, and criminal ways of Pleasure.

I shall not at present give these Persons the Satisfaction of smiling at me, for *Preaching* them out of these dangerous Gaieties as a Divine; but I hope they will suffer me as a Lover of my Country, and a Promoter of its general Good and Interest, to set the Matter of Planting in such a Light, and make the Manner of doing it so *easy* and *familiar*, that every one (as Occasion and Circumstances offer) may lend a helping hand to retrieve our past Losses, and at the same time see that he is doing something that may be for his own *present* Pleasure and Advantage, but most certainly for the Interest of his *Family*, and a *publick Good*.

The Learned and Ingenious Mr. *Evelyn*, was the first that gave the World a right Sense of this thing, and went to the Bottom of the whole Mystery of Planting *Forest-Trees*. Even the present Age may bear the Repetition of his Truths; and as there are others of late who have enlarged this Knowledge by further Experience and Observation, I satisfy my self that all Curious and Inquisitive Persons, such at least as have a Taste and Relish for these rural Diversions, will readily give us the Hearing, and think their time not ill spent, if they see now and then something new, to strike their Fancy, or to put them upon Experiments *Innocent*, *Diverting* and *Profitable*.

Soil.] The first thing then that I shall speak to, is the *Ground* or *Soil* proper to be chosen for a Plantation of *Wood*. And this being indeed the Foundation of the Whole of what is to be expected, it may be necessary to premise some general Rules concerning it. Now altho' Trees will many times thrive on coarse Land, yet it is undoubtedly true that the deeper and richer the Soil is, the more prosperous and taller Trees you may expect; all Trees commonly growing shrubby, unfruitful, or unnaturally spreading on their Tops, where the Soil is either dry or shallow. However, I am not for making choice of the best Grazing or Meadow Ground, which turn to the greatest Profit other ways; because there are many sorts of Land not worth above five or ten Shillings an Acre, not very good for either Corn or Grass, that will do very near as well for *Forest-Trees*. What I would therefore chuse (if choice may be had) should be of the *Loamy* nature, and such too where neither Spade nor Plough has ever come, which I call *untried Earth*. It is thought that all Soils whatsoever may be reduced to these three general Heads; *Sand*, *Loam*, and *Clay*: Every one of which are alike tending to Vegetation, as having their Proportions of Salt, and Vegetative Matter. But whereas *Sand* tho' it is hasty in its Productions, yet by its *slipperiness* and too easy separation of its Parts, soon loseth its Riches and Vegetative Power; and *Clay*, whose Parts are closely wrought together, will not part with the Vegetative Matter therein contained, nor easily suffer the Fibres of Plants and Trees to make their way thro' it; but if its Parts are separated by digging, and by a due mixture of Sand, or some such slippery Body, kept open, we soon see the Effects of its Vigour and Vegetative Power.

We find indeed *Clay* has certain Plants growing upon it, which are as it were *natural* to it, and thrive *better* in it than in any other Soil; but then there is no such thing as *pure Clay*; for by every Experiment made upon it, there is always found to be some Mixture of *Sand*. And *Sand* likewise hath its *natural* Plants, which delight in it, and will not prosper so well elsewhere; but then also it must be said that all *Sandy Soils* have a great deal of other Mould and Vegetative Matter mixt with it. So that when it happens that a Soil hath a due and proper Proportion of these two, *Sand* and *Clay*; this is what may be called *Loam*; the *Middle* betwixt the two Extremes, and which hath therefore this Property belonging to it, that the Trees natural to *Clay*, and those natural to *Sand*, will both equally grow and prosper in a *Loamy Soil*, as *Loam* partakes of the Qualities both of *Sand* and *Clay*.

From all the Observations I have made about the Natures and Properties of Soil, this I take to be right Reasoning; and the *Uses* to be made of it are many; but I shall only at present, (besides what is to our Purpose in the choice of Soil for a Plantation) observe by the way; that in all our Mixtures and artificial Composts contrived to forward Vegetation, we strive to imitate *Nature*, and avoid all indigested Dungs and *forcing* Ingredients. These, tho' they *hasten* Nature, yet make her *tire* by the way. Whereas in the growth of Plants, Nature's, like the Carriers Pace, is best; *Fair and Softly*. Wherefore Dr. *Agri-*
cola's ingenious Whim of accelerating the Growth of *Forest-Trees* by an artificial *Manner*,

my, tho' it may excite Wonder and Curiosity, yet is by no means to be made a common Practice: For such Methods have plainly the same Effects in Trees as the use of hot and strong Liquors has in Men: They *raise* their Spirits, but *shorten* their Lives.

After what I have here said about a *Loamy Soil* and *untried Earth*, as what are to be preferred as the best Foundation whereon to raise Woods and Forests, the diligent Planter will not be at a Loss to know how to chuse. And yet if he cannot *chuse* as he would, he should not yet *refuse* every Soil that is not exactly agreeable to *Loam*; because, as I have observed, some Trees will thrive in the *strongest Clays*, as the *Oak*, the *Lime* and *Fir*: And others will also thrive in *Sand* or *Gravel*, as the *Walnut*, the *Ash* and the *Sycamore*: And others again will flourish most in *low and Marshy Grounds*, as the *Poplar* the *Abele* and the *Willow*.

The Seminary.] When therefore a right and proper Place is pitch'd on for a *Seminary* or *Nursery* of Forest-Trees, (well guarded if possible from the *North* and *West* Winds) let it first be cleared of all *Whins*, *Busbes* and other Trumpery; and then let it be throughout well trench'd with the Spade *two spit* deep, casting the upper part or Surface of the Earth *undermost*. This may be thought a considerable Charge, but the quick Growth of the Trees will abundantly repay and answer it. There is no need to stay, to give this Nursery a Summer and Winter's Mellowing, as some (weakly enough) have advised; but let the one half of it be well work'd with the Harrow in *October* and laid into Beds about four Foot wide, and the other half (that especially which may seem to want mellowing by the Frost in the Winter) may be let alone till the Spring, for there are those two Seasons for sowing the *Mast*, and *Both* of them are sometimes attended with Misfortunes; and besides, some Seeds are best sown in *Autumn*, and others in the *Spring*.

The Seed.] The Ground then being prepared and ready for sowing, and a suitable Place allotted for different Seeds by themselves, chuse the ripest and soundest Seed of every sort, such as easily shake from the Boughs of the most thriving Tree; the shape and weight of the Seed inform which is the best, and how they may be set, lying on one side with their small End to the Earth, from which part they put forth the Root first, which when it hath laid hold of the Ground, from the same Place sends forth the Shoot which is to form the Tree. Altho', as I have observed, both Seasons are proper for sowing Mast, yet it is by many thought that the Mast of all Trees should properly be sown when Nature directs, especially *Acorns*, viz. as soon as they are ripe. For those which are sown in *Autumn* have been observed for the most part to succeed, whereas those sown in *Spring* sometimes miscarry and fail; owing (as some think) to the Rooks and Mice which are then greedy of them; whereas they are otherwise employ'd in *Autumn*: And yet before *February* the Seed will be disposed for Growth; and the Land not being then fresh and new broke up, the Rooks, &c. will not be tempted to seek for Food, as they always do in new broken up Ground: However, still it is good to make use of both Seasons.

Being thus provided with Seeds of all Kinds, it is still to be considered what sorts are proper to be *Sown* and what to be *Set*. The heavy and larger Seeds are more proper to be *Set* regularly in Rows with a Line; such as *Acorns*, *Chestnuts* and *Walnuts*; which last are still best to be planted with the Green Husk on, the bitterness whereof prevents the Mice meddling with them, which otherwise they are very greedy of. The *Sycamore*, *Beech*, *Elm* and *Ash*, are most proper to be sown; tho' it ought to be remembered that the *Ash-Keys* (for Mr. Bradley either forgot himself or mistook) will not come up till the second Year; and therefore the best way is to gather them as you do Haws, and lay them by in Heaps for a Twelvemonth, till Seed-time. Many sorts of Trees may be propagated by Layers, which is done by flitting the Branches a little way with a Cross cut, and laying them half a Foot under Mould, and if they do not well comply, peg them down with a Hook. Other Trees may be raised of Cuttings, as the *Willow*, *Poplar* and *Alder*. And many also from Suckers which come from the Roots: But still the best and safest way is (I think) from the *Seed*, for these Reasons: (1.) Because they *take* soonest. (2.) Because they make the handsomest Trees and most uniform Shoots. (3.) Because they will neither require staking nor watering, as transplanted Suckers and Layers do.

Careful weeding of this Seminary and Nursery for the first two or three Years hath been generally thought a very necessary piece of Care and good Husbandry; but I have been told from an ingenious and old Practitioner and Planter, Sir William Hustler in *Yorkshire*, that in the Progress of his Plantation he has found very little difference betwixt *careful weeding* and *not weeding* at all. It must be owned that the great Care and Charge which is commonly bestowed on the *Weeding* a Plantation is what hath *tired* many, and *frighted* more; and if the Success be no way equal to the Charge, the best way is to trust the Plantation to Nature, well guarded from foreign Invasions of Cattle. Exact *Weeding* he hath observ'd hath greatly let in the Summer drought, and stunted the Seedlings;

Seedlings; and if Weeds may a little over-shadow the Plants, still they keep the Ground cool and moist, which balances the other Inconvenience. The Trial both ways is easily made, and I am apt to think if only some of the larger Weeds that shoot upwards were removed, this Method of Sir *William's* is best and most rational.

After the Seedlings are two or three Years old, where they are thickest, some should be drawn and transplanted into other parts of the Nursery at proper Distances, and the rest remain for Trees; always supposing still that the whole be well defended from the Brouze of Cattel, till they are got out of their reach: If at any time you discover in the Nursery an awkward ill-shapen Tree, the best course you can take, is to cut it off slope-wise at the bottom where the Crookedness begins, and the next Year you will find it to make one strait Shoot, and will quickly recover that Discipline so as to make a fine handsome Tree: I have seen at *Greencroft* at my Friend *James Clavering's*, Esq; a young Oak thus served, and I found from the Place of Amputation it had shot in one Summer more than three Yards perpendicular. The Objection which some make to this, that it spoils the But-end when it comes to be Timber, is of little weight, because it is supposed to be cut near the Ground, and then only too when the Tree will not otherwise be brought into shape and vigour. A *small* Crookedness in a young Tree is much mended by a gentler Discipline, *viz.* Cutting it in the *Ham transversely* and *perpendicularly*, three Inches above, and three below the place of bending.

Thus much may be thought sufficient to be said of Nurseries and preparatory Seminaries in general; what Directions and Rules are wanting with respect to particular Trees will be taken notice of when we come to treat of those *particulars*: In the mean time, that I may proceed regularly, I shall set down here a compleat Catalogue of all sorts of Trees great and small, such as are found to grow in *England* without Housing, dividing them into four Classes, *viz.*

1. Large *Forest-Trees*.
2. *Forest-Trees* of a less and humbler Size.
3. *Ever-Greens*. And,
4. *Flowring-Shrubs*.

And I put them here in this View, because such a Collection and compleat Catalogue as this, I have long since thought would be a Curiosity that any Gentleman, who is a Lover of Vegetables, should naturally desire to have in some one part of his Ground, where he may at one View behold all the Sorts and Varieties of Trees and Shrubs, which his Native Country by Art and Care is made to present him every Day in the Year. These may be made a very goodly Sight, by having only one of every sort; and Rows of each Class placed so discreetly one before another, the tallest *first*, the humbler sort of *Forest-Trees next*; the *Ever-Greens next*, and *Flowring Shrubs* in the *Front*.

Here then followeth the Catalogue under their several Classes.

Large Forest-Trees.

The Oak { with its
Mistletoe.
The Ash.
The Elm { Witch
English and
Dutch.
The Beech.
The Abele.
The Aspine.
The Poplar.
The Walnut.
The Lime { broad leav'd
and wild.
The Sycamore.

Lesser Trees.

The Alder.
The Birch.
The Hazel and Filbert.
The Horn-beam.
The Marple.
The Servise.
The Wild Pear. }
The Crab. }
Mulberry { Black and
White.
The Chesnut. }
Horse Chesnut. }
Wild Cherry { Black and
Red.
The Quick-beam.
White Thorn. }
Black Thorn. }
Glaffenbury Thorn. }
The Withy. }
The Sallow. }
The Ozier. }
The Willow { Red,
White,
Sweet.
Tamaris.
The Plane.
The Elder. }
The Medlar. }
L' Azzerole. }
The Lotus, or Nettle-Tree. }
The Cornel-Tree. }
Larch or Larix. }
Bucks-horn.
Accacia. }
Buckthorn. }

Hackberry Tree, whose Fruit
is harsh and unpalatable.
Hickory Tree from Carolina.
Cotton Tree.
Muscovy Apple Tree.
Mirabolan Plum.
Manna Ash.
Canada Berberry.

Ever-Greens.

The Ilex { dwarf and
tall.
The Holly: Of many Sorts.
The Eugh.
The Phylerea.
Alaternus.
The Box.
Cork-Tree; two Sorts.
Juniper { English and
Swedish.
Laurel { English
Cherry
Alexandrian.
Cypress.
Fir { Scotch, Silver and
Norway.
The Pine.
Arbor Vitæ.
Ivy, strip'd and plain.
Savine.
Pyracantha.
Celastrus or Staff-Tree.
Arbutus.
Cedar { New-England,
Virginia,
Bermudas,
Lebanon.
Rosemary { common broad-
leav'd.
Rosemary strip'd { White
Yellow.
The Bay.
Laurus-tinus.
Privet.
Lentiscus or Mastic-Tree.
Maternus.
Butcher's Broom.
Prickly Box.
Sothorn Wood.
Snow-drop Tree.
Groundfel-Tree from Virgi-
nia.
Olcafter.

Flowering-Shrubs.

Sena Tree.
Laburnum.
Maracoc or Passion-Tree.
Honyfuckle, several Sorts.
Pomgranate { Fruit and
double Flower.
Solanum { Strip'd and
Plain.
Meferion { Yellow and
Scarlet
Berry.
Gilder-rose.
Rose; of several sorts.
Lilac.
Almond { Dwarf and
Standard.
Jessamine { White,
Yellow,
Strip'd, and
Purple.
Althea-frutex { Purple,
White.
Tulip-Tree.
Spirea frutex.
Spanish Broom.
Syringa.
Dog-Tree.
Sea Ragwort.
Barba Jovis.
Virgins Bower.
Periwinkle.
Amara dulcis.
Olive-Tree,
Oleander, or Rose- } tender.
bay,
Agnus Castus.
Cytifus or Bean Trefoil.
Sage-Tree.
Prim-Rose-Tree.
Dwarf-Plane or Whitten-tree.
Sea-Holly.
The Linden, Lime-Tree, or
Wild Lemon.
The Carob or Bean-tree, sweet
The Cistlus.
Bladder Nut.
Balm of Gilead.
Pistacia-Tree.
Benjamin-Tree.
Caper-Tree.
Cackinea, or Tea-Tree.
Coccigria.

Large Forest-Trees.

OAK-TREE.

THE Oak is a large *Glandiferous* Tree, of a hard lasting Wood, rugged Bark, and Leaves waved on the Edges.

Of this Tree much is to be said; but the best Account I can give is, that a piece of Ground respecting the *South-East*, rather than *full South*, and well protected from the *North* and *West*, is the best for a Seminary or Seed-Plot: This ought to be broken up before the Winter you sow, to mellow it, especially if it be a Clay, and then the Furrow would be made deeper, or so at least as you would prepare it for *Wheat*: Or which is best of all, you may *Trench* it with the Spade; by which means it will be the easier cleansed from all Obstructions: Then having given it a second stirring with a Harrow immediately before you sow, cast and dispose it into Rills, or small narrow Trenches, of four or five Inches deep, and in even Lines at two Foot Interval; for the more commodious Runcation, Hawing, and Dressing the Trees. Into these Furrows strow your Acorns, not too thick, and cover them well with a Rake or Harrow: But (to be more accurate) Set them as you do Beans. Do this in the *stiffer* Grounds at the latter end of *October*, and in the *lighter* about *February*.

Let the *Acorns* be gathered in their just Season, that is, when *dropping* ripe, and from fair *thriving* Trees: And six Bushels of Acorns will sow or plant an Acre of Ground, at one Foot distance. Your Plants when they begin to *peep*, should be Earthed up, especially after breaking of the greater Frosts, and when the swelling Mould is apt to *Spue* them forth; but when they are about an Inch above Ground, you may in a moist Season draw them up where they are too thick, and set them immediately in other *Lines* or *Beds* prepared for them; or you may plant them in double *Fosses*, where they may abide till they are of a fit Stature to be transplanted; and then they should be set at such distances as the several kinds of *Oaks* require; but if you draw them only for the thinning of your *Seminary*, prick them into some empty Beds at one Foot interval, leaving the rest at two or three.

When your Seedlings have stood thus till *June*, bestow a slight digging upon them, and scatter a little half-rotten Lither, Fearn, or old Leaves among them, to preserve the Roots from scorching, and to retain the Moisture; and then in *March* following, you shall chop it all into the Earth, and mingle it together: Continue this Process for two or three Years successively; for till then the substance of the Kernel will hardly be spent in the Plant, which is of great Import; but then (if the Stature of your Plants invite) you may set them forth, carefully taking up their Roots; and cutting the Stem within an Inch of the Ground, (if the Kind suffers the Knife) set them where they are to continue: If thus you reduce them to the distance of forty Foot, the Intervals may be planted with *Ash*, which may be felled either for Poles or Timber without prejudice to the Oak. Some repeat the cutting we speak of the second Year, and after *March* re-cut them at half a Foot from the Surface; and then meddle with them no more: But this must be done with a very sharp Instrument, and with Care, lest you violate or unsettle the Root; which is to be practised upon all those that you did not transplant, unless they are very thriving Trees; and then it shall suffice to prune off the Branches and spare the Tops; for this Amputation establishes your Plants by diverting the Sap to the Roots, and frees them from the Injury of the Winds, and makes them handsome straight Shoots, infinitely preferable to such as are abandon'd to Nature and Accident without this Discipline: By this means the Oak will become excellent Timber, shooting into straight and single Stems: To this I am to add, that as often as you make your Annual transplanting out of the Nursery, by drawing forth the choicest Stocks, the rest will be improv'd by a due stirring and turning of the Mould about their Roots.

In planting preserve the Roots, and especially the Earth adhering to the smallest Fibres, which should by no means be shaken off; for those tender Hairs are the very Mouths and Vehicles which suck in the Nutriment, and transfuse it into all the parts of the Tree; and these perishing, the larger Roots, hard, and less spongy, signify little but to establish the Stem: Therefore we should bind the Mould about them, or transfer the Roots in Baskets, to preserve it from forsaking them; for this Earth being fitted to the Mouths of the

the Fibres, it will require some time to bring them in Appetite again to a new Mould, and may be dangerous.

The Pits and Fosses, into which is design'd the Transplantation, ought to be prepared and left some time open to macerating Rains, Frosts and Sun, that may resolve the compacted Salt, render the Earth friable, mix and qualify it for Aliment, and to be more easily drawn in and digested by the Roots and analogous *Stomach* of the Trees: This to some degree may be *artificially* done, by burning of Straw in the newly open Pits, and drenching the Mould with Water, especially in over dry Seasons.

There is no certain Rule at what distances Trees should be planted; for various quantity of Soils will make Alteration. If these that affect cold and moist Grounds be planted in hot and dry Places, then set them in closer order; but Trees which covet scorching dry Grounds, at farther distance. The like may guide in Situations expos'd to impetuous Winds and other Accidents; which may serve for general Rules.

To contribute to the Stability of our transplanted Trees, something is to be premised concerning their *staking*, and securing them from external Injuries, especially from Winds and Cattle; against which, Copices and Woods are sufficiently defended by the Mounds and their closer order; especially if they rise of Seed: But where they are expos'd in single Rows, as in Walks and Avenues, the most effectual course is to *empale* them with three good quarter Stakes, of competent Length, set in a Triangle, and fastened to one another by short pieces above and beneath; in which a few Brambles being stuck, secure it abundantly, without that *choaking* or *fretting* to which Trees are obnoxious that are only single staked and bushed as the vulgar manner is; and in this the Advantage is more than the Charge. Where Cattle do not come, a piece of Rope tied fast about the Neck of Trees upon a Whisp of Straw, to preserve it from galling, and the other end tightly strained to a Hook or Peg in the Ground (as the Shrouds in Ships are fastened to the Masts) sufficiently establishes Trees against the *Western* Blasts without more trouble, for the Winds of the other Quarters seldom infest us: And if the Cords be well pitch'd they will serve many Years. But notwithstanding all this, a noble Person tells my Author, that in *windy Scotland* he never stakes his Trees, but makes his Servants set up again those that are thrown down; and thus they strike Root so fast, that nothing but the Axe is able to prostrate them; for they loosen the Mould, and so prepare it to receive the better Nourishment.

The *Oak* carries it from all other Timber whatsoever for the building of Ships, being tough, bending well, strong, and not too heavy, nor easily admitting Water. As to the variety of Oaks, there are four sorts only; two of which are most frequently with us: The two frequent Oaks are the *Quercus Urbana*, which grows more upright, and being clean and lighter is fittest for Timber; and the *Robur*, or *Quercus Sylvestris*, which is of an hard black Grain, bearing a small Acorn, and affecting to spread in Branches, and to put forth its Roots more above Ground; and therefore in the planting to be allow'd a greater distance, *viz.* from twenty five to forty Foot (nay, sometimes as many Yards) whereas the other shooting up more erect will be contented with *fifteen*. This kind is farther to be distinguished by his fulness of Leaves, tarnish, and becoming yellow at the Fall, and the Roots growing very deep and straggling.

'Tis the Propagation of these large spreading Oaks, which is especially recommended for the excellency of the Timber, which require room to amplify and expand themselves, and would therefore be planted in Forests, at more remote distances, and free from all *Incumbrances*: For by *dressing*, and *due Culture*, many Years advance is to be gain'd.

Both these kinds should be taken up very young, and transplanted about *October*; some, for these hardy and late springing Trees, defer it till the Winter be well over; but the Earth had need be moist; and tho' they will grow tolerably in most Grounds, yet do they generally affect the *sound, black, deep, and fast* Mould, rather *warm*, than *over-wet* and *cold*, and a little *rising*: This produceth the finest Timber; for as says *Pliny*, this is a general Rule, What Trees soever which grow tolerably either on Hills or Valleys, arise to greater Stature and spread more amply in the lower Ground; but the Timber is far better, and of a finer Grain, which grows upon the Mountains. The Timber of those Trees which grow in moist and shady Places, is not so good as that which comes from a more exposed Situation, nor is it so close, substantial and durable; but yet what is Wind-shaken never comes to good. Generally the close-grain'd is most stout and permanent; and it is to be noted, that the *Oak* neither prospers in very *hot*, nor excessive *cold* Countries: If I were to chuse the Place for the Tree, it should be such as grows in the best Cow-pasture, or upland Meadow, where the Mould is rich and sweet; and in such places you may also transplant large Trees with extraordinary Success; and therefore it were not amiss to bore and search the Ground where you intend to plant or sow, before you fall to work; since

since Earth too shallow or rocky is not proper for this Timber, the Roots fix not kindly; and tho' for a time they may *seem* to flourish, yet they will be apt to dwindle. However, to remove all Discouragements;

Oaks prosper exceedingly in *Gravel* and *moist Clays*, even the *coldest Clay* that will hardly graze; but they frequently make stands as they meet with variety of Footing; and sometimes proceed again vigorously as they penetrate beyond, or outgrow their Obstructions, and meet better Earth; which is of that consequence, that my Author affirms that more than fifty or an hundred Years advance is clearly gain'd by Soil and Husbandry.

In *Hampshire* at a place call'd *Silcester*, there have grown *Oaks* (some of which have contain'd ten load a Piece) out of the Walls, which seem'd to have struck Root into the very Stones; and in the Forest of *Dean* some goodly *Oaks* have grown upon Ground which has been as it were a *Rock* of antient Cinders, buried there many Ages since. But it is observ'd that *Oaks* which grow in rough stony Ground, and obstinate Clays, are long before they come to any considerable Stature; but in time (as has been before observ'd) they afford the most excellent Timber, having stood long, and got good Footing: The same we may affirm of the *lightest Sands*, which produce a smooth-grain'd Timber, of all other the most useful for the Joiner; but that which grows in the Gravel is subject to be short and brittle.

Mr. *Evelyn* tells us he has made the Experiment of grafting the *Oak*, but with very little Success; altho' some affirm it will *take* the Pear and other Fruit: But for this curiosity he rather advises Inoculation. He does not much encourage the transplanting of young *Oaks*, except the Ground be extraordinarily qualified, or that the *Oak* be not above six or seven Foot growth in height: Yet if any will try, let their Stems be of the smoothest and tenderest Bark; for that is ever an indication of Youth, as well as the paucity of their Circles, which in disbranching and cutting the Head off at five or six Foot height, may, before you stir the Roots, serve for the most certain guide; and then plant them immediately, with as much Earth as will adhere to them, in the Place destin'd for their Station; abating only the Tap-roots, (which is that downright and stubby part of the Roots all Trees rais'd of Seeds do almost universally produce) and quickening some of the rest with a sharp Knife, (but sparing the Fibres which are the main Suckers and Mouths of all Trees) spread them in the Foss or Pit which hath been prepared to receive them: Unless you will rather Trench the whole Field, which is incomparably the best, and infinitely to be preferred before narrow Pits and Holes, in case you Plant any number considerable. For the Earth is hereby made loose, easier and penetrable for the Roots, about which you are to cast that Mould, which, in opening of the Trench you took from the Surface, and purposely laid apart; because it is sweet, mellow and better impregnated: But in this Work be circumspect, never to enter your Stem deeper than you found it standing; for *profound burying* frequently destroys a Tree, tho' it is an Error *seldom* observ'd: If therefore the Roots be sufficiently cover'd to keep the Body steady and erect, it is enough; and the not minding this seemingly trifling Circumstance, does very much deceive our ordinary Planters and Woodmen: Most Roots covet the Air, (altho' that of the *Quercus Urbana* least of any; for like the *Æsculus*,

*How much to Heaven her tow'ring Head ascends,
So much towards Hell her piercing Root extends.*)

And the perfection of that does almost as much concern the Prosperity of a Tree, as of a Man himself.

Beside what has been said, the Position must be sedulously observed; for the *Southern* parts being more dilated, and the Pores expos'd (as evidently appears in their horizontal Sections) by the constant Eccentricity of their hyperbolical Circles, being now on the sudden, and at such a Season converted to the *North*, does *starve* and retard more Trees, how careful soever the Roots have been order'd, and Ground prepar'd, than any other Accident whatsoever (neglect of staking and defending from Cattle excepted;) the Importance whereof ought to be considered; Mr. *Evelyn* having sometimes transplanted great Trees at *Midsummer* with success (the Earth adhering to their Roots) and *miscarried* in others where this Circumstance only was omitted. The bigger the Tree, the more this Circumstance is to be regarded.

To observe therefore the Coast, and the side of the Stock (especially of Fruit Trees) is not a *Trifle*, as some pretend: For if the Air be as much the Mother, or Nurse, as Water and Earth, as more than probably it is, such blossoming Plants as court the Motion of the Meridian Sun, do as it were evidently *point out* the Advantage they receive by their Position, by the Clearness, Politure, and comparative Splendor of the *South* Side: And the frequent

Mossiness

Mossiness of most Trees on the opposite Side, sufficiently denotes the Unkindness of that Aspect; and which is most evident in the Bark of Oaks, white and smooth; the Trees growing more kindly on the *South* Side of an Hill, than those which are expos'd to the *North*, with an hard, dark, rougher and more mossy Integument, which has been experimented on moving some Trees to a *Northern* dripping Shade. Whole Hedge-Rows of Apples and Pears have perished after their Shelter has been remov'd: The good Husbands expected the contrary, that the Fruit should improve, as freed from the Predations of the Hedge; but Use and Custom made the Shelter necessary; and therefore a Stock for the Time is the weaker taken out of a Thicket, if it be not well protected from all sudden and fierce Invasions either of crude Air or Winds.

There are other Rules concerning the Situation of Trees, altho' when something shelter'd from *North*, *East*, and *West*, 'tis best; as also from Marshes, unwholesome Fogs, Hills and Seas, which expose them to the Weather; but particularly from those *Sylvifragiventi*, or *cruel* and *tedious Western* Winds; altho' those which standing in Winds do conquer and are not shaken, are the most strong and solid, especially Trees expos'd to the *North*: But a hot Gravel and loose Earth doth seldom well; for an Oak in good Ground shall double its Growth, tho' next to this (and perhaps before it) is preferr'd good Air. We shall sometimes see Woods to all Appearance growing on the same Soil, when one Oak of the same Age will contain double to another in Heart and Timber: And that in one the Heart will not be so big as a Man's Arm, when the Trunk exceeds a Man's Body. This ought to be well weighed in the first Plantation of Copses, and a good Eye may discern it in the first Shoot, the Difference proceeding from the Variety of the Seed; therefore let it be gather'd from the best sort of Trees.

To transplant an *old Tree* was formerly esteem'd a wild and difficult Enterprize; yet Count Maurice (Governor of *Brazil*) planted a Grove near his Paradise of *Friburg*, containing six Hundred *Coco-Trees* of eighty Years Growth, and fifty Foot high to the nearest Bough: These he waisted upon Floats and Engines, four long Miles, and planted them so successfully, that they bare abundantly the very first Year; and Monsieur de Fiat. (a Marshal of *France*) hath with huge Oaks done the like at *Fiat*. Also a great Person in *Devon*, planted Oaks as big as twelve Oxen could draw, to supply some Defect in an Avenue to his House; and the Lord Fitz-Harding practis'd the removing of great Oaks in the following manner:

Chuse a Tree as big as your *thigh*; remove the Earth from him; cut through all the collateral Roots, till with a competent strength you can force him down upon one side, so as to come with your Axe at the Tap-root; cut that off, re-dress your Tree, and so let it stand cover'd about with the Mould you loosen'd from it, till the next Year, or longer if you think fit; then take it up at a fit Season; it will likely have drawn new tender Roots apt to take, and sufficient for the Tree, wheresoever you shall transplant him. To facilitate the Removal of large Trees, for the Adornment of some particular Place, or the Rarity of the Plant, there is this Expedient: A little before the hardest Frosts, make a square Trench about your Tree at such Distance from the Stem, as you judge sufficient for the Root; dig this of competent Depth, so as almost to undermine it, by placing Blocks and Quarters of Wood, to sustain the Earth; this done, cast in as much Water as may fill the Trench, or at least sufficiently wet it, unless the Ground were very moist before: Thus let it stand till some very hard Frosts do bind it firmly to the Roots, and then prepare it to the Pit, made for its new Situation, which you may preserve from freezing by laying Store of warm Litter in it, and so close the Mould the better to the straggling Fibres, placing what you take out to your *new Guest*, to preserve it in Temper: But if the Mould about it be over heavy, you may raise it by a Crane, or Pulley hanging between a Triangle, which is made of three strong and tall Limbs united at the Top where a Pulley is fastened, as the Cables are to be under the Quarters, which bear the Earth about the Roots: For by this means you may weigh up, and place the weighty Clod upon a Trundle to be convey'd, and re-planted where you please, being let down perpendicularly into the Place by the Assistance of the aforesaid Engine. And by this Address you may transplant Trees of a wonderful Stature without the least Disorder, and many times without topping or diminution of the Head; which is of great Importance, where this is practised to supply a Defect, or remove a Curiosity.

Trees of ordinary Stature transplanted (being first well water'd) must be sufficiently stake'd and bush'd to protect them from the Violence of Wind, Rubbings of Cattle, or such like; till being well grown and fixed (which may be in four Years) they shall be able to withstand all accidental Invasions but the Axe: For I am now come to their *Pruning* and *Cutting*, in which Work the Seasons are of great consequence.

Therefore from *Timber-Trees* cut off *no Heads*, nor be too busy with *Lopping*; but for *Shade*, *Fuel*, or *Mast*, lop off their *Tops*, and prune unthriving *Branches* only. If you intend an out-right *Felling*, expect till *November*; otherwise the *Sap* not being perfectly at rest, the *Worms* will breed there: But for the *Chimney* you need not be so punctual.

The best time of *Felling* is just before they begin to decay; but such as appear decaying are first to be cut down, and then those that are approaching to it; but the plain thriving indulged till last. The best way to know the State of the *Tree*, is to bore with a middling *Piercer*, made *Auger-fashion*, and to examine what Substance comes by the frequent pullings out. Some will pronounce shrewdly the State of a *Tree*, by digging a little about the *Roots*; and when the *Tree* perishes at *Top*, it is ever a Mark of great Decay in the *Roots*. There is also a *swelling Vein*, which discovers itself eminently above the rest of the *Stem*, altho' invested with *Bark* like the rest, and which frequently circles about the *Tree* like *Ivy*, which is an infallible sign of *Hollowness*. The common Season for this Work is about the End of *April*, (when the *Bark* does commonly rise freely.) Men greatly differ in this Point: But without doubt, while the *Trees* are over moist they are not so fit for the *Axe*, for they are more obnoxious to *Putrefaction* and the *Worm*; wherefore it is advised before a *Fall* to make a *Gash* to the *Pith*, that the whole *Moisture* may distil; for the *Vessels* that ascend in the *Bark*, are called the *Arteries*, and those that descend in the *Sap*, I may rather say the *Trunk*, are the *Veins*. Some superstitious Persons lay great stress upon the time of the *Moon* and *Day*, when *Timber* should be fell'd; and not only so, but the *Strength* of the *Wind*, and the *Corner* from whence it cometh; which last indeed may be of some use in consideration of the *Place* where it is design'd to lie; but otherwise the *Woodman* would make but small *Riddance*, and be like the *Husbandman* in the *Proverbs*, that minded the *Winds*, and therefore cou'd neither *sow* nor *reap*.

In order to *Felling* of *Timber* (in case of buying) Mr. *Evelyn* approves of *Markham's* Advice, who says, "Survey your *Woods* as they stand, immediately after *Christmas*; and "then divide the *Species* in a *Note-Book*, and consider for what *Purposes* every *Kind* is "most useful: After this, reckon the bad and good together, that *one* may put off the "other without *gleaming* the best *Timber*. This done, learn the marketable *Prices* near- "hand of the several sorts; as what so many *Foot square* and long is worth for the several "Employments; what *Planks* and other *Scantlings*, &c. are fit for so many *Spokes*, "Rings, *Pales*, *Poles*, *Spars*, &c. As suppose it were *Ash*, to set apart the largest for "the *Wheelwright*, the smallest for the *Cooper*, and that of ordinary *Scantling* for the "Ploughs, and the *Brush* to be kidded and sold by the *Hundred*. And so all other sorts of "Timber, viz. large, middling *Stuff* and *Poles*, &c. allowing the *Waste* for the *Charges* "of *Felling*, &c. All which you shall compute with greater certainty, if you girt it "with a *String*, and reduce it to the *square*, &c. by which you may give a near *Guess*: "Or you may mark such as you intend to fell; and then begin your *Sale* about *Candle-* "mas, till the *Spring*; before which you must not lay the *Axe* to the *Root*; tho' for "some particular *Uses*, as for *Ploughs*, *Carts*, *Axle-Trees*, *Harrows*, and the like, it is "common to cut in *October*; and indeed were it not for the sake of the *Bark*, every "Oak ought to be cut down before *February*.

One of the first and most principal things with *Workmen* in *Felling* of *Trees*, is the skilful disbranching of the *Boal* of all such *Arms* and *Limbs* as may endanger it in the *Fall*; and therefore in a very great *Arm*, chop a *Nick* under it close to the *Boal*, that so meeting with the downright *Strokes*, it may be sever'd without *splitting*. In *Trees*, what is call'd the *Male*, is much *harder* than the *Female*. If you design a fresh one to grow from the *Roots*, fell your *Tree* as close to the *Ground* as possible; besides, the longer the *Stick* of the *Tree* fell'd, the better it is for many *Uses*. Some will not cut a seedling *Oak*, so as to have any thing grow from its *Root*, because they say it produces a *reddish* *Wood* not acceptable to the *Workman*; and that the *Tree* that grows on the *Head* of his *Mother* does seldom arrive to be good *Timber*. It is observ'd, that one *Foot* of *Timber* near the *Root* (which is the proper *Kerse* or *Cutting-place*) is worth three farther off: But let this be enquir'd into, and it seems to be of no great weight.

When your *Tree* lies on the *Ground*, then strip off the *Bark*, and set it so as it may dry best; then cleanse the *Boal* of the *Branches* which were left, and saw it into *Lengths* for squaring. And to make excellent *Boards* and *Planks*, some advise you should *bark* your *Trees* in a fit *Season*, and so let them stand a *Year* before *Felling*; which seems rational enough.

Before *Timber* is remov'd, the *Dew* should be off. Lay up your *Timber* very dry, in an airy *Place*, out of *Wind* or *Sun*, and laying along one *Piece* upon another, interpoling
some

some short Blocks to preserve them from Mouldiness, which they usually contract while they sweat; and which frequently produces a kind of *Fungus*, especially if there be any *sappy* Parts remaining. Some Persons submerge their Timber in Water to hinder the cleaving, and this is good. Lay therefore your Boards a Fortnight in the Water, and then setting them upright in the Sun and Wind, so as it may freely pass through them, turn them daily; and thus treated, newly sawn Boards will floor better than by many Years dry seasoning. But to prevent all possible Accidents, let the Joints for your Floors be shot, fitted and tack'd down only for the first Year, *nailing* them for good and all the next: For thus they will not in the least *shrink*. But I take it, *Oak* is but little used for flooring of Houses. Among Wheelwrights, the *Water-seasoning* is of especial Regard. The *Venetians*, for their Arsenal Provision, lay their *Oak* some Years first in Water. Some commend Buryings in the Earth; and there are Seasonings of the Fire for hardening of Piles, which are to stand either in the *Water* or the *Earth*.

But notwithstanding these Seasonings, the greenest Timber is sometimes desirable for such as carve and turn; but for *Doors*, *Windows*, *Floors*, and other *close Works*, it is altogether to be rejected. Therefore 'tis best to chuse such as is of two or three Years seasoning, and in the mean between moist and dry.

Timber which is *cleft* is not so obnoxious to rift and cleave, as what is *hewn*, nor *squar'd*, as *round*. Large Columns bored through from End to End, is an excellent Preservative from splitting; tho' to cure this Accident, rubbing with a Wax-cloath is good; or before it be converted, the smearing it over with Cow-dung, which prevents the Effects both of Sun and Air, if it must be expos'd. The *Hollanders* coat their Timber that is expos'd to the Sun with a Mixture of Pitch and Tar, on which they strew powder'd *Cockle-shells* mixt with Sea-sand and Scales of Iron beaten small, which *arms* them after an incredible manner. But the Timber must be well dry'd; and to prevent *Fire*, they rub them with a *Wash* made of *Allom*.

The most *ponderous Timber* is best for all Uses, and what sinks deepest in the Water is such; also freedom from Knots and Sap is a great Excellence. Some affirm, that *old Oak*, *old Walnut*, and *young Ash*, are best for most Uses; but in *Ship-building* it does not hold, for *old Timber* will be apt to be *brittle*. That Timber is esteem'd best that grows most in the Sun, and on a dry and hale Ground; for those Trees which suck least are hardest and longest liv'd: The Climate therefore contributes much to its Quality, and the *Northern* Situation is preferr'd, tho' there are *some* Exceptions. The Wood under Ground is thought to be worth almost as much as what is above; for tho' 'tis less, yet 'tis of more value for many Purposes.

As to the *Felling* of Fuel-Wood, begin with the Under-wood, especially *Oaks*, as soon as they will strip, but not after *May*; and so fell as the Cattle may have the browsing; but fell no more in a Day than they can eat; then kid or *bavin* them on the Ends to preserve them from rooting: Thus the Under-wood being gone, the rest will prosper the better. If you head or top for the Fire, begin three or four Foot above the Timber, if it be considerable; but if only shaken Trees and Hedge-Rows, strip them even to thirty Foot high; and 'twere good to top such as wither at the Tops a competent way beneath, to prevent their Sickness downwards, which will else certainly ensue; whereas, thus dying Trees may be preserv'd, tho' they never advance taller. This is a profitable Observation for such as have old doating, or any ways infirm Woods. In other Fellings, disbranch from Bottom to Top: And for cutting for Fuel, you may at the Sides cut a Foot or more from the Body; but never when you shred Timber-Trees. 'Tis ill to cut Fire-Wood when the Sap is up, for 'twill never burn well. *East* and *North* Winds are reckon'd unkind to the succeeding Shoots.

Oaks from the first Semination are in some Places ready to be cut for Coppice in *fourteen* Years; and some Acorns set in Hedge-Rows, have in thirty Years, Stems of above a Foot diameter. Generally Coppice-wood should be cut close, and at such Intervals as the Growth requires; which being seldom constant, depends much on the Places and the Kinds, the Earth and the Air, to direct us. Oak for Tanners Bark may be fell'd from *April* to the last of *June*, by a Statute of *Jacobi*.

Nothing is more deceitful than *standing* Trees, so various are their hidden Infirmities, till they be felled and sawn out. A Timber-Tree, whether of *Oak* or other Wood, is compar'd to a Merchant Adventurer; you shall never rightly know what he is worth till he is dead.

With *Oak*, *Houses*, *Ships*, *Cities* and *Navies* are built; and some is so tough and extremely compact, that our sharpest Tools will hardly enter it, and scarcely the very Fire itself; in which it consumes but slowly, as seeming to partake of a *ferruginous* and *metallin*

tallin shining Nature, proper for sundry *robust* Uses. It is doubtless, of all Timber hitherto known, the most universally useful and strong: For tho' some Trees are harder, as *Box*, *Cornus*, *Ebony*, and divers of the *Indian Woods*, yet we find them more fragil, and not so well qualified to support great Incumbencies and Weights; nor is any Timber more *lasting*, which way soever used. That which is *twined* and a little *wreathed*, (easily to be discern'd by the Texture of the Bark) is best to support Burthens; for Posts, Columns, Summers, &c. for all which, our *English Oak* is infinitely preferable to the *French*, generally speaking. 'Tis found that the rough-grain'd Body of a *stubb'd Oak*, is the fittest Timber for *Engines*, *Pales*, *Laths*, *Cooper's Ware*, *Clap-board* for *Wainscot*, &c. and some *Pannels* are curiously vein'd. There is in *New-England* a certain *Red Oak*, which being fell'd, they season in some moist and muddy Place, which branches into very curious Works.

Oak is excellent for *Wheel-Spokes*, *Pins* and *Pegs* for tiling, &c. the knottiest for *Water-Works*, *Piles*, and the like; the crooked, and yet firm, for *Knee-Timber* in Shipping, *Mill-Wheels*, &c. Of *Coppice-Oak*, *Hoops* are made much better than of *Hazel*; for they being of the youngest Shoots, are exceeding tough and strong. One of them being of *Ground Oak* will out-last six of the best *Ash*; the smaller Truncheons and Spray make *Billet*, *Bavin* and *Coals*; and the *Bark* is of Price with the *Tanner* and *Dyer*, to whom the very *Saw-dust* is of use.

The *Ground-Oak*, while young, is used for *Poles*, *Cudgels* and *Walking-Staves*. Most *Roots* have some excellency for fair, beautiful, chamleted and lasting Timber, applicable to many Purposes; such as formerly made *Hafts* for *Daggers*, *Hangers*, *Knives*, *Handles* for *Staves*, *Cups*, *Tobacco-Boxes*, and elegant *Joiner's Work*, and even for some *Mathematical Instruments* of the larger Size, &c. Neither is to be omitted the *Galls*, *Mistletoe*, *Polypod*, *Agarick*, *Fungus's* to make *Tinder*; and many other useful Excellencies, to the Number of above *twenty*, which discover the Variety of Virtues of this *admirable Tree*.

Acorns are a good Feed for *Hogs*, and other Cattle. 'Tis said, a Peck of *Acorns* a Day with a little *Bran*, will make a Hog increase a Pound Weight a Day for two Months together. They give them also to *Oxen*, mingled with *Bran*, chopp'd or broken, otherwise they are apt to *sprout*. Some advise to *macerate* them first in Water to extract their Malignity, lest the Cattle by a new Food perish. They are most proper for Swine, and being made small, will fatten Pidgeons, Peacocks, Turkeys, and other Poultry. *Acorns* were heretofore the Food of *Men*, and in the Time of the *Romans* the Custom was in *Spain* to make a second Service of *Acorns* and *Masts*, as the *French* now do of *Marrons* and *Chestnuts*. And some Authors mention an *Oil of Acorns* chymically drawn, which they affirm to be of the longest Continuance, and least consumptive of any Lamps and Lights.

Oaks also bear a *Knur* full of a cottony Matter, of which they antiently made Wick for their Lamps and Candles. *Varro* affirms, that *Salt* was made of *Oak*, which they sometimes used for Meat, but chiefly to sprinkle among and fertilize their *Seed-Corn*; and without doubt 'twas better for their Corn and Meat, for such may be made of our *Pot-Ashes*. Of the *Galls* is made the Grounds and Basis of *Inks*, and several *Dyes*, especially sadder Colours. The white Moss composes the choicest *Cyprus Powder*, which is esteem'd good for the Head. Young *red Oak Leaves* boil'd in Wine, make an excellent Gargle for a sore Mouth; and almost every Part of the *Oak* is a sovereign Medicine against *Fluxes* in general.

The Water of *May-Dew* from *Oak Leaves* is of admirable Effect in *Ruptures*; and the distill'd Water of *Acorns* is reckon'd good against the *Phthisick*, *Stitch* in the Side, and heals inward *Ulcers*, breaks the *Stone*, and refrigerates *Inflammations*, being apply'd with Linnen dipp'd therein: And some affirm, that the *Acorns* eat fasting, kill the *Worms*, provoke *Urine*, and break even the *Stone* itself; to say nothing of the *Viscus's*, *Polypods*, and other Excrecencies, of which innumerable Remedies are compos'd; some of which see under the Head of *Mistletoe*.

As we have had in all Ages, *Oaks* of prodigious Stature and Growth in many Part of *England*, I shall here take some notice of them. The Duke of *Norfolk*, in *Workop Park*, had an *Oak* spreading almost 3000 square Yards, under the Shade whereof, near a Thousand Horse might commodiously stand at once. Dr. *Plot*, in his History of *Oxfordshire*, mentions an *Oak* near *Clifton*, spreading from Bough-End to Bough-End eighty one Foot, shading in Circumference 560 square Yards of Ground, under which 'twas computed 2420 Men might very well stand in Shelter: And a bigger near the Gate of the *Water-Walk* at *Magdalen College*, whose Branches shot 16 Yards from the Stem: Likewise of another at *Ricat*, the Lord *Norrey's Park*, under, which 4374 Men could sufficiently stand. 'This was that *Robur Britannicum* so much celebrated by the Author of *Dodona's Grove*.

In *Denington Park* near *Newbury* were three Oaks said to be planted by *Jeofrey Chaucer*; one was 50 Foot high before any Bough or Knot appear'd, and cut five Foot square at the *But-end*, all clear *Timber*: The *second* held 40 Foot excellent *Timber*, itrait as an Arrow in Growth and Grain, and cutting four Foot at the stub, and near a Yard at the top; besides a Fork of almost ten Foot clear *Timber* above the *Shaft*: This Oak was of a kind so excellent, that it cut a Grain clear as any *Clap-board*. And the *third* call'd *Chaucer's Oak*, was a very goodly Tree; and it's remarkable that these Oaks were not 300 Years old. This was a *gravelly Clay Soil*, moisten'd with small and frequent Springs.

At *Framingham* in *Suffolk* grew the Oak which furnish'd the Main-mast of the old *Royal Sovereign*, which was 99 Foot long, 35 Inches diameter: But this Tree was exceeded by the Oak which afforded the Beams that lay thwart her, the Diameter whereof was four Foot nine Inches, which yielded four square Beams of four and forty Foot each. In *Sheffield Lordship* near to *Rivelin*, stood an Oak which had 18 Yards without Bough or Knot, and carried a Yard and six Inches square at the same height or length; and not much bigger near the Root: And in *Sheffield Park* there was an Oak call'd the *Lady's Oak*, that contain'd 42 Tun of *Timber*, which had Arms that held at least four Foot square for ten Yards in length; the Body six Foot, of clear *Timber*. At *Firth's Farm* there was an Oak valued at 80 *l.* In the upper end of *Rivelin* stood the *Lord's Oak*, of twelve Yards about: And in the same Park was a Tree, which when cut and laid flat upon a level ground, two Men on Horse-back could not see each other over it. At *Reedham* in *Norfolk* grew an Oak valu'd at 40 *l.* the *Timber*, and 12 *l.* the *Lop-Wood*. In a Coppice of my Lord *Craven's* there was an Oak that yielded 19 Tun and a half of *Timber*, 23 Cord of *Fire-wood*, 2 Load of *Bark*. Sir *Edward Harley* tells us, in a Park of his he had an Oak the Trunk whereof did compleatly seat with *Wainscot Pews* a whole Church; and that he had several other Trees of the same Stature: But his Trees were but Chips in comparison of a Tree in the Neighbourhood, in which every Foot forward, one with another, was half a Ton of *Timber*; it bore five Foot square, and forty Foot long, &c. and the Boughs afforded twenty five Cord of *Fuel Wood*. This Gentleman declar'd in a Letter to Sir *Robert Morray*, that he was assur'd by an Inquisition taken about three hundred Years from that Time, that his Park and some adjacent Woods, had not then a Tree capable to bear *Acorns*; yet that Park he had seen full of great Oaks, and most of them in the extremest wane of decay.

This seems to determine the Age of Trees, according to the common Observation, that an Oak is one hundred Years a growing, one hundred Years at a stand, and another hundred in its decay.

The MISLETOE.

THIS Plant usually growing upon some or other kind of the Forest-Trees, well deserves a Place amongst them: And both for its extraordinary Virtues, and for its uncommon way of Propagation, highly merits a very particular Description. *Pliny* in his Natural History is very full in treating of this curious Super-Plant; but our modern Observations about the manner of its Growth and Propagation, and its Use in Physick, so far surpassing every thing that was said of it by the Antients, I shall content my self to observe, that the great Veneration and Esteem which the *Druids*, formerly Priests and Philosophers of this Island, acquired to themselves, proceeded from the almost miraculous Cures which they performed by means of the *Mistletoe* of the Oak, which was in a peculiar manner held Sacred with them. However, I think our ingenious Country-man, Sir *J. Colbatch*, in his short Treatise of the admirable Virtues of this Plant, hath given right and strong Reasons, that the difference of Trees doth little or nothing alter the Nature of the Plant. And therefore concludes, that there are the same Virtues to be found in the *Mistletoe*, upon what Tree soever it grows: And the general Method of its Propagation he hath found to be this

“ There is a Bird generally known by the Name of the *Mistletoe Thrush*; which Name I suppose it derives from its feeding upon *Mistletoe Berries* during the Winter-Season: “ From the Pulp of the Berries it is nourished, but the Seeds are discharged with the “ Excrement undigested. Now the Excrement being of a slimy Nature, sticks fast to “ the Branches of the Trees, upon which it falls, and if there be any crack in the Bark, “ there the Seed lodges itself, and produces a Plant the next Year: The Excrement being of the Nature of Birdlime, and Birdlime, as it is said, being to be made of the Ber- “ ries

“ries of this Plant, gave rise, I suppose, to that very old Saying, that * *Turdus cacat sui*
“ *Excidium*.

How this Plant thrives in hotter Climates, and whether it will be perswaded to grow upon Ever-greens like itself, I have never yet learnt; but the artificial way of propagating it, where you have a mind, is to open the Bark of the Tree with a Knife, and therein to stick the Seed in the Winter-Season when it is ripe. But it should regularly be placed on the upper part of a Branch running horizontally, that it may be supply'd with Dews and Rain for its Nourishment and Growth. Mr. *Bradley* observes, that the manner of making its first Roots from the Seed, is by sending out from its Center three Claws, which fix themselves on the Bark of the Tree in three Points of a Triangle, and are at their Extremities like the Mouths of Leaches, whereby they draw their Nourishment.

After it is become a Plant of some bigness, it proceeds to blossom and bear Fruit, and will live to a great Age. There have been several Experiments try'd to make it grow in the Ground or prepared Earth; but I could never hear of any that have succeeded, even with the utmost Care. Some have imagined that it much weakens the Tree on which it grows, because it commonly is found on old Trees; but there cannot be much in that. Old Trees rather than young ones being more subject to Cracks and Accidents, which give Life to the Seeds there scattered. And it is very much to be questioned whether the *Mistletoe* receives its full Nourishment from the Juice of the Tree; because tho' it is indeed alive in the Summer-time, when the Sap most freely circulates, yet it is then *but alive*, and doth not begin to flourish, till the Sap abates of its Vigour and Activity, and the Leaves of the Tree begin to drop. Insomuch that the Berries of this extraordinary Plant are not full ripe till the latter end of *December*; and which is more extraordinary still, it is observable that the Rigour and Severity of the Winter adds much to the Vigour and Verdure of the *Mistletoe*. All which considered, makes it highly probable, that it derives its principal Support and Nourishment from the Vegetable Particles floating in the Air. This might be proved by an easy Experiment of circumcising the whole Bark of the Branch on which it grows, two or three Inches wide below, so as to hinder any Communication of the Sap that way.

The ingenious Sir *J. Colbatch* hath recommended the Virtues of this wonderful Plant to the World with great Force and Spirit, to be used chiefly in all Epileptick Cases. His History of Cures performed thereby are indeed surprising: But there is a good deal of care to be taken in preparing its Powder. His method is, at the latter end of *December* to gather the Leaves, Berries, and tender Twigs, drying them altogether over a Baker's Oven, where there was a constant gentle Heat. After that he had it made into very fine Powder to be put into a Glass covered with a Bladder, and kept in a very dry Place. The larger Stalks he also kept dry'd for Decoctions and Infusions. He tells us of a distressed Youth of twelve Years of Age, who for five Years had laboured under violent convulsive Fits, without hopes of Remedy. He gave him only half a Dram of the Powder made into a Bolus with Syrup of Peoneys every six hours, and after it a large draught of a strong Infusion of the Stalks bruised and sweetned with Syrup of Peoneys, and it succeeded so well, that he had not one Fit from the time he began to take this glorious Medicine, for a Month or more; and never one Cataleptick Fit to the day of his Death. In short, it is now generally accounted one of the best Specificks in all Epileptick Cases, and is so much better in its kind than the Jesuits Bark, that, contrary to the Nature of that, the more of it is taken, so much the better.

ASH-TREE.

THE *Ash* is a Tree which bears its Seeds in single Teguments, and these Seeds are contained in membraceous Coverings, or Seed-Vessels, it hath winged Leaves, a smooth Bark, and a tough Wood.

The *Ash* is with us reputed *Male* and *Female*, for that the *one* bears Keys, the *other* never any; the one affecting the *higher Grounds*; the other the *Plains*, of a whiter Wood, and rising many times to a prodigious Stature: So as in forty Years from the *Key*, an *Ash* hath

* It is more than probable, that this was what Theophrastus, in his History of Plants, had in his Eye, when he relates, that a Bird, having let fall a Grain of Seed, which it could not digest, into the Cleft of a Branch, the Substance mix'd and incorporated so with the Tree, that it grew, and gave the first hint and occasion to Grafting.

been sold for thirty Pounds *Sterling*: And 'tis credibly reported, that one planted so many *Ashes* as in his own Life-time were justly valu'd at *Fifty Thousand Pounds*.

The *Keys* being gathered from a young thriving Tree, when they begin to fall (which is about the end of *October*) are to be laid in a place to dry, and then sowed any time betwixt that and *Christmas*, but not altogether so deep as *Beech Masts*: They will lye a full Year in the ground before they appear; and because you must carefully fence them all that time, therefore if you would make a considerable Wood of them at once, dig or plough a Parcel of ground, as you would prepare it for Corn; and with the Corn, especially Oats, so also good store of *Keys*; take off the Crop of Corn, or seed it in its Season, and the next Year following 'twill be covered with young *Ashes*, which will be fit either to stand (which is best) or be transplanted for divers Years after: And these will be far better than those from Woods, (especially *Suckers*, which are worth nothing) being remov'd at one Foot stature, the sooner the better, and well defended from Cattle. The reason of this hasty transplanting, is to prevent their obstinate and deep rooting, which makes them hard to be taken up when they grow older; and being remov'd they take no great hold till the second Year, after which they come away again: Yet some of five and six Inches diameter have thriven as well as the smaller Trees. You may accelerate their springing by laying the *Keys* in Sand, and some moist fine Earth, or a row of Earth and a row of *Keys*; but lay them not *too thick*, nor *double*; and in a cover'd, tho' airy Place, for a Winter before you sow them; and the second Year they will come away greatly, so as you trim and cleanse them. Cut not their *heads* at all, not by any means the *fibrous part* of the Root; only the downright, or tap-root, is to be *totally* abated: And this ought to be in the Months of *October*, or *November*, and not in the *Spring*.

'Tis better to spare the *head* than the *side-branches* of the *Ash*, (which while young may be cut close) because being yet tender, it is but pithy, and of a spongy Substance; but being once well fixed, you may cut him as close to the Earth as you please; it will cause him to shoot prodigiously, so as in a few Years to be fit for *Pike-shaves*; whereas, if you take him *wild* out of the *Forest*, you must of necessity strike off the *head*, which much impairs it.

Young *Ashes* are sometimes in Winter *Frost-burnt*, black as Coals; in which case it is best to cut them down to the very bottom: For from the low Cuttings come out *Ground-Ashes*, so much sought after for *Arbours*, *Espaliers*, and other *Pole-works*: They will spring in abundance, and may be reduced to *one* for a Standard-Tree, or Timber. *Ash* will be propagated from a Bough flipp'd off with some of the old Wood, a little before the Bud swells, but with difficulty by Layers. Such as they reserve for Spears in *Spain*, they keep stript up close to the Stem, and plant them in close order, and moister Places; these they cut above the Knot in *January*, which is rather of the latest.

'Tis ill to plant *Ash* in Plow-Lands, kept in Tillage; for the Roots will be obnoxious to the Coulter, and the Branches dripping upon Corn spoils it: But in Hedge-Rows and Plumps they will thrive exceedingly, and without doing injury, where they may be dispos'd at nine or ten Foot distance, and sometimes nearer. But in planting a whole Wood of several kinds of Trees for Timber, every *Third* at least should be an *Ash*. Some say, (but it is not very material) that the *Ash* will receive a Graff of its own kind; or be inoculated with the *Pear* and *Apple*. The best *Ash* delights in the best Land, (which it will soon *impoverish*) yet grows in any; so as it be not over stiff, wet, and approaching to the *marshy*, unless it be first well drained: By the Banks of Chrystal Streams they thrive infinitely. There is as much difference in the Timber of the *Ash* as the *Oak*; much more than is found in any one kind of *Elm*. The *Ground-Ash* (like the *Oak*) much excels a Bough of the same bulk of *Elm* for Strength and Toughness: And in farther emulation of the *Oak*, it has been known in some Places to prove as good and lasting Timber for Building, nay, preferr'd before it, where there has been plenty of *Oak*; vast difference there is also in the strength of *Ground* and *Quarter'd-Ash*. 'Tis likewise remarkable, that the *Ash* grows when the Bark is as it were peeled off. Some *Ash* is curiously *camleted* and vein'd so differently from other Timber, that 'tis priz'd equal with *Ebony*, and has the Name of *Green Ebony*.

The use of *Ash* is (next to that of the *Oak* itself) one of the most *universal*: It serves the Soldier for *Spears*, the Carpenter, Wheelwright, Cartwright for *Ploughs*, *Axle-Trees*, *Harrowes*, &c. and makes the best *Oars*, and *Blocks* for Pulleys and *Sheffs*, as Seamen name them: It also serves the Cooper, Turner, and Thatcher; and nothing is like it for Garden *Palisade-Hedges*, *Hop-Yards*, *Poles*, *Spars* and *Handles*, *Stocks* for Tools, *Spade-Trees*, &c. The *Ash* is useful from the *Pike* to the *Plough*. There is extract'd an *Oil* from *Ash*, by the procession of other Woods, which is excellent to recover the *Hearing*, some drops of it

it being distilled warm into the Ears; and for the *Caries* or *Rot* of the Bones, Tooth-ach, pains in the Kidnies and Spleen, the anointing therewith is most sovereign. The *Chymists* commend the Seed of *Ash* as an admirable Remedy for the *Stone*. The dead Leaves of *Ash* afford (like those of the *Elm*) Relief to our Cattle in Winter; and there is a *Dwarf* sort in *France*, whose *Berries* feed the poor People in scarce Years; but it bears no Keys like to ours, which being pickled, afford a delicate sallading. But the shade of the *Ash* shelters a noxious Insect; and for their leafing so late, and falling so soon, they are not to be planted either for *Umbrage* or *Ornament*, especially near the Garden, because the Roots are prejudicial, and the long-leav'd Stalks are drawn by clusters into the Worm-holes, and so foul the Allies with their Keys. The Truncheons of this Wood make the third sort of most durable *Coal*, and is the sweetest of our Forest-Fuelling, being fittest for Ladies Chambers: It will burn even when green, and the Sap is yet in it.

The *Season* for felling of this Tree, is when the *Sap* is fully at rest; for if it be cut down too early or late, it will be so obnoxious to the *Worm*, as greatly to prejudice the Timber; therefore be sure not to fell till the three Mid-winter Months, beginning about *November*. But in lopping of *Pollards* (as of soft Wood) it is best to stay till towards the Spring, and that the Lops grow not too great. As soon as a *Pollard* comes to be considerably hollow at the head, cut it down, for otherwise the Body will decay more than the head is worth. The same is to be done with taller *Ashes*, where the Woodpeckers make holes, which constantly indicates their being faulty or rotten.

As to the further Virtues of the *Ash*, it may be observed, that the Juice thereof is much recommended as a sovereign Remedy against Poison, and the sting of Serpents. *Pliny* speaks of this Tree as of a wonderful Vulnerary; and assures us, that in all Nature there is no Specifick for healing of Wounds, and against Poison, that can be compared to the Juice of the young Shoots and Leaves of *Ash*. According to his own Experience, he gives this Description of it. The Juice of *Ash* (saith he) is a powerful Remedy against the biting of Serpents, for to drink of it will perform the Cure. Apply some Leaves of this Tree to a Wound and it will heal. I know not any Remedy so speedy and certain; and I believe there is nothing in the World so good and safe. The *Ash* is so powerful a Remedy against Serpents, that neither in the Evening nor Morning, when the shade of the Tree stretches furthest, no Serpent whatsoever will dare to pass under it. And I know by my own Experience, that a Serpent enclosed with *Ash*-Leaves, and a Fire thoroughly kindled, will throw himself rather into the Flames, than cross over the Leaves*.

But indeed, since the Days of *Pliny*, many other Virtues have been discovered in the *Ash*; and among the wonderful things said of it, if but one half of them were true, we should find in this single Tree almost an entire Dispensatory; and the Leaves, the Wood, and the Juice of the *Ash*, would be sufficient to furnish an Apothecary's Shop. † *Schottus* has collected no less than thirty seven Virtues, which the *Germans* ascribe to the several Parts of this Tree. To which I refer the Curious.

But after all; I cannot but wonder, with Mr. *Evelyn*, at the universal Confidence of our Botanists, who are apt to take things upon Trust from one another, especially if they can support a Paradox by the Authority of so great a Man as *Pliny*: How they can assert a thing so improbable and so contrary to Truth, as the Serpent avoiding an *Ash*-Bough, and chusing the Fire. *Pliny* himself, I doubt, gave into many things only on Hear-say and Report; and his Followers have done very ill to spread many of his Mistakes.

* Contra Serpentes verò Succo expresso ad potum, & imposita Ulceribus, opifera ac nihil aequè reperiuntur Fraxini folia: Tantaque est vis, ut ne matutinus quidem occidente sue Umbras, quæ sunt longissimæ Serpens arboris ejus attingat, adeo ipsam procul fugiat. Experti prodimus, si fronde ea gyro claudatur Ignis & Serpens, in Ignem potius quam in Fraxinum fugere Serpentem. *Hist. Nat. Lib. xvi. Cap. 13.*

† *Schottus* Joc. Ser. Nat. & Art. Cent. 3. Propos. Pag. 299.

ELM-TREE.

THE Elm is a Tree bearing its *Seeds* in single Teguments or Coverings, that are *membranaceous*, with *falcaceous* Husks, whose Leaves are *rough* and *indented*, and having a *ruddish* Bark.

Of these Trees, Mr. *Evelyn* says there are four or five sorts; but we reckon *two* or *three* only are most worthy of our Culture: The vulgar *English*, or Mountain-Elm, being of a less jagged and smaller Leaf; and the *Dutch* or *French-Elm*, whose Leaves are thicker and more florid, delighting in the lower and moister Grounds, where they will sometimes rise to above an hundred Foot in height, and a prodigious growth in less than an Age; there is also the Witch-Elm.

It has been generally thought that the Elm has no Seed, but Experience shews the contrary; and though all of these are commonly rais'd of Suckers, yet they grow and come well from the Seeds, which are ripe about the beginning of *March*, or the following Month. To raise them of their Seeds, being well dry'd a day or two before, and sprinkled in Beds prepared of good loamy fresh Earth; sift some of the finest Mould thinly over them, and water them when need requires: Being risen (which may be within four or five Months) an Inch above ground, refresh'd and preserv'd from the scraping of Birds and Poultry, comfort the tender Seedlings by a second sifting of more fine Earth to *establish* them; thus keep them clean weeded for the first two Years, and cleansing the Side-boughs; or till being arriv'd of fitting Stature to remove into a Nursery at wider Intervals, and even Rows; you may thin and transplant them in the same manner as you do young *Oaks*; only they shall not need above one cutting, where they grow less regular and hopeful. But because all this is something troublesome, 'tis advis'd that Suckers should rather be planted about the end of *October*, when they will grow very well.

Even Stakes of Elm sharpen'd at the ends for other purposes, take root familiarly in moist Grounds, and become Trees. Truncheons of the Boughs and Arms, about a Yard or Ell long, chop'd on each side opposite, and laid into Trenches half a Foot deep, and covered about two or three Fingers with good Mould, increase abundantly. The Season for this Work is about the end of *January*, or early in *February*, if the Frosts hinder not; and after the first Year you may cut or saw the Truncheons off in as many places as you please, and as the Shoots and rooted Sprouts will direct you, for Transplantation.

Besides these ways for propagating *Elms*, let Trenches be sunk twenty or thirty Yards from such Trees as stand in Hedge-Rows, and in such Order as you desire your Elms should grow; where these Trenches are, many young Elms will spring from the small Roots of the adjoining Trees: Divide after one Year the Shoots from their *Mother-Roots* with a sharp Spade; these transplanted will prove good Trees, without damage to their *Progenitors*. Or lop a young *Elm*, the Lop being about three Years growth; do it in the latter end of *March*, when the Sap begins to creep up into the Boughs, and the Buds are ready to break, into Lengths of four Foot slanting, leaving the Knot where the Bud seems to put forth in the middle: Inter these in Trenches of three or four Inches deep, and in good Mould well trodden, and they will infallibly produce you a Crop, for even the smallest Suckers of *Elms* will grow (being set) when the Sap is newly stirring in them.

There is yet a *fourth way* no less expeditious: Bare some of the Master-Roots of a vigorous Tree within a Foot of the Trunk, and with your Axe make several Chops, putting a small Stone into every Cleft, to hinder their closure, and give access to the Wet; then cover them three or four Inches thick with Earth; and thus Mr. *Evelyn* assures, that one single Elm well order'd will make a fair Nursery, which after two or three Years, you may separate and plant in the Place design'd for them; and which, if it be in clumps, within ten or twelve Foot of each other, or in Hedge-Rows, it will be the better: For the *Elm* is a Tree of *Consort*, *Sociable*, and so affecting to grow in Company, that the very best do almost touch one another; this also protects them from the Winds, and causes them to shoot of an extraordinary Height, so as in a little more than forty Years they arrive to a *Load* of Timber, provided they be carefully cultivated, and the Soil propitious. An *Elm* does not thrive so well in the *Forest*, as where it may enjoy Scope for the Roots to dilate and spread at the sides, as in *Hedge-Rows* and *Avenues*, where they have the Air likewise free. They do very properly by Layers also.

Of all the Trees in our Woods, none better suffers a Transplantation than the Elm; for you may remove a Tree of twenty Years growth with undoubted Success. My Author has transplanted an *Elm* as big as his Walle; but it was *disbranched* all but the *Summit*, which was *entire*, and he took him up with as much Earth as he could, and refresh'd him

him with abundance of *Water*: This is an excellent and expeditious way for great *Persons* to plant the *Accesses* of their Houses with; for being dispos'd at sixteen or eighteen Foot interval, they will in a few Years bear goodly Heads, and thrive to admiration. Some emplaster the wounded Head of such over-grown *Elms*, with a Mixture of *Clay* and *Horse-Dung*, bound about with a Whisp of *Hay* or fine *Moss*, which may do well if temper'd so as the Vermin nestle not in it. For more ordinary Plantations (not *Vistas*'s and *Avenues*) younger Trees which have their Bark smooth and tender, clear of Wens, about the scantling of your Leg, and their Heads trimm'd at five or six Foot height, are to be preferr'd before all others; but Experience tells us we can hardly plant an Elm too big, provided you lop his Head in a due Proportion to what hath been taken from the Roots.

There is no Tree whatsoever becomes *Walks* and *Avenues* comparably to this *Majestick* Plant. At the *Escorial*, belonging to the King of *Spain*, are planted, for Leagues together, these Trees; and some of them forty Yards high, are kept stript almost up to the very top Branch, which renders a most glorious and agreeable Sight. And the *Elm* is, by reason of its aspiring Nature (unless it be topp'd to enlarge the Branches and make it spread) the least offensive to *Corn* and *Pasture Grounds*, to both which, and the Cattle that feed therein, they afford a kind Shade and Defence, and are at the same time an agreeable Ornament.

The *Elm* delights in a *sound, sweet, and fertile* Land, something more inclined to *Loamy* Moisture, where good Pasture is produced; tho' it will prosper in the gravelly Land, provided there be a competent depth of Mould, and it be refresh'd with Springs; in defect of which, being planted on the very Surface of the Ground (the Swarth par'd first away, and the Earth stirr'd a Foot deep or more) they will undoubtedly succeed; but in this Trial, let the Roots be handsomely *spread*, and cover'd a Foot or more in height, and above all *firmly stack'd*. This is practicable also for other Trees, where the Soil is over-moist, or unkind: For as the *Elm* does not thrive in too dry, sandy, or hot Ground, no more will it abide the cold and spungy; but in Places that are competently fertile, or a little elevated from these *Annoyances*, as we see in the Mounds and casting up of Ditches, the *Female sort* upon the Banks thereof does naturally delight.

It should be planted as *shallow* as may be; for (as I am willing often to repeat it) deep interring of Roots is a *great mistake*. And new planted Elms are to be kept moist, by frequent refreshings, upon some half-rotten Fern and Litter laid about the Foot of the Stem, the Earth being a little stirr'd and dispers'd for the better Reception and Retention of the Water. The Plantations must be carefully preserv'd from *Cattle*, and the *Concussions* of impetuous Winds, till they are out of the reach of the *one*, and sturdy enough to *encounter* the *other*. When you lop the *Side-boughs* of an *Elm*, be careful to indulge the *Tops*; for they protect the Body of your Trees from the Wet, which always invades those Parts first, and will in time occasion them to *perish* to the very *Heart*: This *Lopping* may be done about *January* for the Fire; and more frequently, if you desire to have them *tall*, or that you would form them into Hedges; for so they may be kept plash'd, and thicken'd to the highest Twigs, affording a most *magnificent* and *noble* Defence against the Winds and Sun.

When you would fell this Tree, let the Sap be perfectly in repose; as is commonly about *November* or *December*, after the Frost has well nipp'd them. And I am told, that both *Oak* and *Elm* so cut, the very Saplings will continue as long as the Heart of the Tree, for some uses, without decay. In this Work, cut your Kerte near to the Ground, but have a care that it suffer not in the fall, and be ruin'd with its own *Weight*: This indeed is a necessary Caution in the felling of all other Timber-Trees. If any begin to *dout*, pick out such for the *Axe*, and rather trust to its *Successor*.

Elms have been grafted, some think, to a great Improvement of their Heads. *Virgil* tells us they will join in Marriage with the *Oak*, especially if you graft under the Earth, upon or near the Root itself, which is likely to entertain the Cyon better than when more expos'd, till it be well fix'd, and have made some considerable Progress. A fair advance for speedy growth, and noble Trees, may be assuredly expected from the grafting of young Elms with the best of their kinds; and where the goodliest of these are growing, the Ground would be plough'd and finely raked in the Season when the Scales fall; that the Showers and Dews fastening the Seed when the Wind drives it, it may take root, and hasten (as it will) to a sudden Tree: And if such were planted near to one another, it is almost incredible what a *Palcing* they would be to our most expos'd Plantations, mounting up their wooden Walls to the Clouds.

When *Quickset* is planted, Mr. *Evelyn* advises to plant an *Elm* every twenty or thirty Foot; and if in planting *Elms* at competent Spaces, and in Rows, you open a Ring of Ground at about four Foot distance from the Stem, and prick in *Quickset* Plants, you may after a while keep them clipp'd at what Height you please; and so preserve them from outward Annoyances. *Elms* are apt to be hollow, which is commonly caus'd by ignorant or careless Lopping, whereby the Wet falls perpendicularly upon a Part, especially the Head: In this Case, if there be sufficient sound Wood, cut it to the *Quick*, and close to the Body, and cap the hollow Part with a *Tarpaulin*, or fill it with good stiff *Loam*, *Horse-Dung*, and fine *Hay* mingled: Old broken Boughs, if very great, are to be cut off at some distance from the Body; but the smaller, close. The *Oak* will suffer itself to be made a Pollard, that is, to have its Head quite cut off; but the *Elm* so treated will perish to the Foot, and certainly become hollow at last, if it escape with Life.

It may not be amiss to inform the Curious here, that if the *Elm* is desired to grow tall and strait, without any smaller Branches out of its Body or Stem, the cutting off such Branches at *Midsummer*, effectually answers that Purpose; for after that you will see no more of them.

In the Mannor of *Norton*, in the Parish of *Ebbisham* in *Surrey*, there were, not long since, *Elms* in good numbers, which did bear almost three Foot square, for more than forty Foot in Height: They grew in a moist *Gravel*, and in the Hedge-Rows. Dr. *Plot* in his Natural History, tells us of an *Elm* in *Oxfordshire*, at least six Yards diameter near the Ground: And also of a *Wich-Elm*, that was so very great and tall, that two able Workmen were five Days in felling it; that it fell forty Yards in Length, was at the Butt-end seventeen Yards in Circumference, eight Yards and a half about by Girth Measure in the Middle, and contain'd about ninety six (if not one Hundred) Tun of Timber; besides *Lop* and *Top*, which made above threescore Loads of Fire-wood: This Tree grew at *Field* in *Staffordshire*; and the Account of it is well attested by Sir *Harvey Bagot* and others.

As to the Uses of *Elm* for *Pumps* and *Water-Pipes*, I find none like it: It is a Timber in most singular use, especially where it may lie continually dry or wet, in *Extremes*; therefore it is proper for *Water-works*, *Mills*, *Pumps*, *Aquæducts*, *Pales*, *Ship-planks* beneath the Water-line, &c. Some *Elm* that has been found buried in Bogs, has turn'd like the most polish'd and hardest *Ebony*; only discerned by the Grain: For the Wheelwright, *Chopping-blocks*, Blocks for the Hat-maker, *Trunks* and *Boxes*, to be cover'd with Leather; this Wood is of use; also for *Coffins*, *Dressers*, *Tables* of great Length, for the *Carvers Work*, and most of the Ornaments appertaining to the Orders of *Architecture*. And besides these and many other Uses, this Wood makes the second sort of *Charcoal*.

The Leaves of this Tree, especially the *Female*, being dried in the Sun upon the Branches, and the Spray stripped off in *August*, are a great Relief to Cattle in the Winter, and in scorching Summers, when Hay and Fodder are dear; they will eat them before *Oats*, and thrive exceedingly well with them. In some Parts of *Herefordshire* they gather them in Sacks for their Swine, and other Cattle. The green Leaf of the *Elm* contused, heals a green Wound or Cut; and boil'd with the *Bark*, consolidates fractur'd Bones: All Parts of this Tree are absterfive; and therefore sovereign for consolidating Wounds, and to assuage the Pains of the *Gout*.

A Decoction of the inward Bark has been much used in *Gargarisms*, or *Mouth-waters*: And a Decoction of it may be also made an admirable diuretic Medicine.

Mr. *Switzer* observes, that he always look'd upon what *Salmasius* had said concerning raising *Elms* of *Chips*, to be but a fabulous Story; till upon buying a great many in *Oxfordshire* for the Plantations at *Blenheim*, it was confirmed in several Places; and one especially where there was a very fine Nursery of *Elms* about five or six Inches diameter, where the Person who was the Owner of them, assured him, that within thirty Years before, there was not one *Elm*, nor any thing like it near them; but that upon hewing a great many *Elm-Trees* for building a Barn, they were perceived the next Year to spring up; and taking care to preserve them from the Cattle, they had come to that Stature he saw them in. Rightly enough supposing, that it might probably be from those Knots which grow thick on *Elms*, rather than the common *Chips*; or indeed rather from some of the green tender Branches trod in, or accidentally covered in the Ground.

This is one of the Trees chiefly to be recommended for Avenues leading to the House: The Walk sixty Foot broad, and the Trees to be set forty Foot asunder.

BEECH-TREE.

THE *Beech* is a nuciferous *European* Tree, containing in one common Husk several Nuts; whose outward Husk is echinate and prickly, bearing a short roundish shining Leaf, and having a smooth Bark, with its Nuts or Mast of a triangular Figure.

The ingenious Mr. *Evelyn*, from *Palmerius*, tells us, that the *Beech* in *Theophrastus* must needs be the *Oak*, and shews his Reasons: But leaving this, there are of *Fags*, or *Beeches*, two or three Kinds with us: The Mountain *Beech*, (where it most affects to grow) which is the whitest, and most sought after by the Turner; and the *Campestral* or *Wild Beech*, which is of a blacker Colour, and more durable. They are both to be raised from the Mast, and govern'd like the *Oak*; and that is certainly the best Way of furnishing a Wood, unless you will make a Nursery; and then you are to treat the Mast as you are instructed in the Account of *Ashes*, sowing them in *Autumn*, or later, even after *January*, or rather nearer the Spring, to preserve them from Vermin, which are very great Devourers of them: But they are likewise to be planted of young *Seedlings*, drawn out of Places where the fruitful Trees abound. In transplanting them, cut off only the Boughs and bruised Parts, two Inches from the Stem, to within a Yard of the Top; but be very sparing of the Root: This is for such as are of pretty large Stature.

They make *spreading Trees*, and *noble Shades* with their well furnished and glistening Leaves, being set at forty Foot distance; but they grow taller and more upright in the *Forests*, where at eight or ten Foot they shoot into very long Poles, but are neither very apt for *Timber* or *Fuel*: In the Vallies, where they stand warm and in Consort, they will grow to a stupendious Height, tho' the Soil be stony and very barren: Also upon the Declivities, Sides, and Tops of *high Hills*, and *chalky Mountains* especially; for they will strangely insinuate their Roots into the Bowels of those seemingly impenetrable Places, not much unlike the *Fir*. *Virgil* reports, it will graft with the *Chestnut*; and being pruned, it heals its Scars immediately, but is not apt to put forth so soon again as other Trees.

The *Beech* serves for various Uses: With it the Turner makes *Dishes*, *Trays*, *Buckets*, and other *Utensils*, *Trenchers*, *Dresser-Boards*, &c. It is also useful to the Wheeler, Joiner, and the Upholsterer, for *Chairs*, *Stools*, *Bedsteads*, &c. For *Fuel*, *Billet*, *Bavin* and *Coal*, though one of the least lasting. If the Timber lies always under Water, 'tis little inferior to Elm. Of the thin *Lamina* or *Scale* of this Wood, are made *Scabards* for Swords, and *Band-Boxes*; *Boxes* for Writings, *Hat-Cases*, and formerly *Book-Covers*; some commend it for *Oars*. The *Mast* is of great use to fat our Swine and Deer; and hath in some Families, even supported Men with Bread. *Chios* endur'd a memorable Siege by the Benefit of this Mast. The Leaves (which make the most agreeable *Canopy* all the Summer) being gathered in *Autumn*, and before they are much Frost-bitten, afford the best *Mattresses* to lay under *Quilts* instead of *Straw*; for which Purpose they are used by Persons of Quality abroad. *Floats* for Fisher's Nets, instead of *Cork*, are made of its Bark: The Shavings of the Wood are good to fine Wines; and the Ashes of *Beech*, with a proper Mixture, excellent to make *Glass* with.

In the Cavities of these Trees, *Bees* much delight to hive themselves: The stagnant Water in the hollow Trees, cures the most obstinate *Tetters*, *Scabs* and *Scurfs* in Man or Beast, fomenting the Part with it; and the Leaves chewed, are good to preserve the *Gums* and *Teeth*.

It is very remarkable, that from the Mast of this Tree, an exceeding sweet Oil is extracted, even not much inferior to the Oil of Olives; and hath been accordingly used in *Sallads*. Mr. *Aaron Hill*, several Years since, wrote a Book of its Virtues, and to recommend its Use: And although his Views might not be altogether justifiable, yet his Relation of Facts were right, viz. That the Oil is sweet and good for almost all Uses; that the Quantity of Oil extracted from the Mast, is no less than a Gallon from a Bushel; and that the Tree once at least in three Years, never fails to afford a vast Quantity, sometimes forty Bushels from one Tree. The late ill Management of some Undertakers should not make one cease to wonder, that so profitable a Tree stands every where neglected, and that its laden Boughs will not excite the Industry and Diligence of an enterprising Age.

ASPEN and POPLAR, ABELE, &c

AS to *Aspen* and *Poplar* they are well known, and easily propagated; therefore I shall say the less. The Shade of *Poplar* is esteemed very wholesome in Summer; but they do not become fine Walks or Avenues, by reason of their *Suckers*; and that they foul the Ground at the Fall of the Leaf. The Leaves are good for Cattle; which must be stripp'd from the cut Boughs before they are faggotted: And this is to be done in the middle of *October*, and reserved in Bundles for *Winter Fodder*. The Wood of *White Poplar* is sought after by the *Sculptor*; and they saw both sorts into Boards, which, where they lie dry, continue a long time.

The *Aspen* is a *White Poplar*, as likewise is the *Abele*: They are best propagated of Suckers from the Roots, the least of which will take; and may in *March*, at three or four Years Growth, be transplanted. In *Flanders* there are large Nurseries of them; and we now, within twenty Miles of *London*, have them plentiful enough. The *Planting* is easily learn'd, and in three Years they will come to an incredible Altitude; in twelve Years be as big as your Middle; and in eighteen or twenty, arrive to full Perfection. By these, in a little time a Man may have his House in a Wood, where a little before, there did not grow a Tree. The *Black Poplar* grows rarely with us, but plentifully abroad: And there is a *Mountain Poplar* near *Vienna*, of which, some Trees have yielded Planks of a Yard in Breadth.

N. B. The planting this Tree in or near Gardens, is by no means to be encouraged; and the Practice is always repented; for that it annoys all the Ground round about it, with its troublesome Suckers from the most extended Roots

The best use of the *Poplar* and *Abele*, is for Walks about low Grounds; but when they come to grow old, they are apt to become *knurly*, and out of Proportion. The Timber is incomparable for all sorts of *white wooden Vessels*, as *Trays*, *Bowls*, *Dishes*, and other *Turner's Ware*; and of especial Use for the *Bellows-Maker*, because it is almost of the Nature of *Cork*; and for Ship-Pumps, though not very solid, yet very close: Also for *Wooden-beels* for *Shoes*, &c. likewise to make *Carts*, because it is exceeding light; for *Vine* and *Hop-Props*, and divers *vimineous* Works. The Loppings in *January* are for the Fire; but this Wood burns untowardly, and rather moulders away, than maintains any solid Heat: Of the Twigs, with the Leaves, are made *Brooms*, where *Birch* and *Broom* are wanting. The Juice of *Poplar* Leaves, dropp'd into the Ears, asswages the Pain; and the Buds contus'd and mixt with Honey, is a good *Collyrium* for the Eyes; as the *Unguent* is to refrigerate and cause Sleep.

Of the *Aspen-Tree* our Woodmen make *Hoops*, *Firewood*, and *Coals*, &c.

WALNUT-TREE.

THE *Walnut* is a *Nuciferous European* Tree, containing in one common Husk one Nut, having a Covering that is thick and pulpy, and an *Oily Kernel*: 'Tis a large Tree of winged Leaves, *odorate*, having a *rugged Kernel*, divided into several *Lobes*.

Mr. *Evelyn* says, that the *Wall* or *Welch-Nut* is of several sorts; the *soft* Shell and the *hard*, the *whiter* and the *blacker* Grain: The *black* bears the *worst* Nut, but the *Timber* is much to be preferr'd; these we might get from *Virginia* and propagate here; they bear a *square Nut*, are of all other the most beautiful, and the best worth planting; but had we store of these, we should despise the rest of our own Product. Those of *Grenoble* are next esteem'd, for their Use to the *Cabinet-Makers*. In all Events, be sure to plant from young and thriving Trees, bearing full and plump Kernels: Though it should be observ'd that you are never sure of having the same Tree from the Nut, because Nature for the most part *degenerates*.

The best way to raise them, is to plant the Nuts, and set them at the distance you would have them stand; for which Purpose, beat them off the Trees, some Days before they quit the Branches of themselves, and keep them in their Husks, or without them till Spring, or bed them (being dry) in Sand or good Earth till *March*, from the time they fell, or were beaten off the Tree. In *March* the Nuts are to be planted, or it may be sooner, if they are interr'd in their Husks; by reason the extreme Bitterness thereof renders them deadly to Worms, &c. It is good to strew some *Furzes* (broken or chopp'd small) under

under the Ground amongst them, to preserve them from *Mice* and *Rats*, when their Shells begin to wax tender; especially if you supple them in warm Cow's Milk, as some Persons do; when sprouted, you are to plant them where they are to abide, but they are most impatient of transplanting: If there be an absolute necessity of removing them, let your Tree never be above four Years old; and then by no Means touch the Head with your Knife, nor cut away so much as the very *Tap-Root*, being so old, if you can well dispose of it; since being of a pithy and hollow Substance, the least Diminution or Bruise will greatly endanger the killing. It may be propagated by a Branch slip'd off with some of the old Wood, and set in *February*, and 'tis certain they will receive their own Cyons being grafted, (and grafted on the *Ash* they will thrive exceedingly) which improves their Fruit; and makes you sure of the sort: Some put a Tilehard under the Nuts when first set, to divaricate and spread the Roots, which are otherwise apt to penetrate very deep: And some say, they may be transplanted when as big as one's Middle, better than when much younger.

The best Compost is the strewing of Ashes at the Foot of the Trees, the Salt whereof being impregnated with the Nitre of the Air, and wash'd into the Earth, is the best dressing; whilst the Juice of the fallen Leaves, though it kill the *Worm*, is noxious to the Root. This Tree doth not refuse to thrive among others, and in great Woods, provided you strip up the collateral Arms: It delights in a dry, sound, and rich Land, especially if it incline to a feeding *Chalk* or *Marle*; and where it may be protected from the cold Winds (though it affects Cold rather than extreme Heat) as in great Pits, Vallies, and Highway-Sides; also in stony Grounds if loamy; and on Hills, especially *Chalky*; likewise in Corn-Fields, (sixty or an hundred Foot distant) where it is so far from injuring the Corn, that it is look'd upon as a great Preserver, by keeping the Ground warm, nor do the Roots hinder the *Plough*.

Walnut-Trees render most graceful *Avenues* to Country Dwellings, and do excellently near the Hedge-Rows; but had need be planted at forty or fifty Foot distance, because they affect to spread both their Roots and Branches. In *Germany* there are Arbours of these Trees for many Miles together; and other very extensive Plantations of them: In *England* we have likewise great Plantations of Walnuts; at Sir Robert Clayton's near *Godstone* in *Surrey* there are seventy Acres of Ground that is planted, whereof a great Part are these Trees; and his Garden also has several Nurseries of young Trees to supply their Defects. About *Carse-Halton* there are many thousands of these Trees, which celebrate the Industry of the Owners, and reward it with infinite Improvement.

The *French* use the Wood of this Tree for most domestick Affairs: It is of singular account with the Joyner for the best grain'd and colour'd *Wainscot*; the Gunsmith uses it for *Stocks*; the Coach-Maker for *Wheels* and *Bodies* of Coaches; the Drum-Maker for *Rimbs*; and the Cabinet-Maker for *Inlayings*, especially the firm and close Timber about the Roots, which is admirable for *Chamblotted* Works. Some Wood, particularly such as comes from *New-England*, &c. is very black of Colour, and so admirably streak'd as to represent natural Flowers, Landscips and other Fancies.

The Fruits of the *Walnut*, with Husk and all, when tender and very young, are fit for Preserves; and for Oil, of an extraordinary use with the Painter in Whites and other delicate Colours, also for *Gold-Size*, and *Vernish*: The Husks and Leaves being macerated a Month in warm Water, and that Liquor poured on Walks and Bowling Greens, infallibly kill the Worms without endangering the Grass. The green Husk dry'd, or the first peeping red Buds and Leaves reduc'd to Powder, serves instead of Pepper to condite Meats and Sauces. The Husks boil'd make a good Colour to dye dark Yellow; and the Distillation of its Leaves with Honey and Urine, makes Hair spring on bald Heads. One Drachm of the inner Bark dried, is a strong Vomit, 'tis said for a lusty Man: For a Pain in the Side, a Pint of the fresh Oil of this Nut gives immediate Ease; and the Juice of the outward Rind makes an excellent Gargle for a sore Throat. Water of the Leaves mundifies and heals *Ulcers*; and the Water of the Husk is sovereign against *Pestilential* Distempers.

One Bushel of Nuts will yield fifteen Pounds of peel'd and clear *Kernels*, and that, half as much Oil, which the sooner 'tis drawn, is the more in Quantity, tho' the dryer the Nut, the better in Quality. The young Nuts before they shell, or at least before the Shell grows hard, are sold in the *Physick* Markets of *London* abundantly, the Juice of which is a principal Ingredient in *Treacle Water*. The green Nuts preserv'd are esteem'd better than the simple Water; but perhaps not by way of Medicine. We endeavour to imitate *Mangoes* with green Walnuts, and also with large *Cucumbers*, or rather small *Melons*, &c. which are excellent Pickles.

'Tis better to *cudgel* off the Fruit, when dropping ripe, than to gather it by Hand; and some believe beating improves the Trees: That the Husk may open, lay them in a dry Room, sometimes turning them with a *Broom*, but without *washing*, for fear of *Mouldiness*: Those Nuts which come not easily out of their Husks, should be laid to Mellow in heaps, and the rest expos'd in the Sun till the shells dry, else they will be apt to perish the *Kernel*. Some Persons keep them in their own Leaves, or a *Chest* of Walnut-tree Wood; others in *Sand*, especially if you will preserve them for a *Seminary*: Do this in *October*, and keep them a little moist, that they may spear, to be set early in *February*: Thus after two Years they may be remov'd a Yard asunder, cutting the Tap-Roots and side Branches, but sparing the Head; and being two Yards high, bud and remove them immediately, that you may be sure of a good sort.

After the *Nuts* are beaten down, the *Leaves* should be sweep'd into Heaps and carried away, because their extreme Bitterness impairs the Ground, and prejudices the Trees. *Old Nuts* are not reckon'd wholesome till macerated in warm, and almost boiling Waters; but if you lay them in a *Leaden Pot*, and bury them in *Earth* free from Vermin, they will keep very plump the whole Year about, and may easily be *blanched*.

It may be further observed of the Walnut, that it is one of the most profitable Trees that can be planted, and if it likes its *Situation* and *Soil*, is a quick grower. It will not indeed thrive on the Tops of *bleak Hills* nor in *wet Vales*, but it will prosper well both on the *sides* of Hills, and in *dry Vales*; in Soils that are either *Chalky* or *Gravelly*, or *Loamy*. It refuses almost no Soil but *strong Clay*, and *barren Sands*: But so great is the difference betwixt a *Walnut* removed with the Loss of its Tap-Root, and another of the same Age standing in the Nursery *without a Remove*, that Mr. *Bradley* tells us he observed one of the *Last* after forty Years was valued at five Pounds, whilst one of the *First* of the same Age was not worth thirty Shillings, tho' they stood both together. *N. B.* They will never thrive where they are much expos'd to cold Winds.

L I M E - T R E E .

THE *Lime-Tree* bears its Seeds in single Teguments or Coverings, contain'd in round Buttons. It hath broad Leaves ending in a Point, being smother *above* than *underneath*, bearing a sweet Blossom, and a round Fruit, about the bigness of a Pea, containing *one Seed*.

Mr. *Evelyn* tells us that of these Trees there are *two* kinds, the *Male* (which some think but a finer Sort of *Elm*) and the *Female*: Tho' this distinction Mr. *Cook* will not allow, because *both* bear Seed. The *Male* is harder, fuller of Knots, and of a redder Colour, but producing neither Flower nor Seed (so constantly and so mature, with us) as does the *Female*, whose Blossom is also very *Odoriferous*, perfuming the Air: The *Wood* is likewise thicker, of smaller Pitch, and not obnoxious to the Worm.

Lime-Trees may be raised either of the Seeds in *October*, or with better success by the *Suckers* and Plants; which should be cultivated like the *Elm*. Be sure to collect your Seeds in dry Weather, airing them in an open Room, and reserving them in Sand till *Mid-February*, when you may sow them in pretty strong fresh and loamy Mould, kept shaded, and moist as the Season requires, and clear of Weeds; and at the Period of two Years plant them out, dress'd and prun'd as Discretion shall advise. It is not only raised by Seed, by Suckers and Layers at the Roots, but even by Branches lopp'd from the Head, may this Tree be propagated; and peeling off a little of the Bark, at a competent Distance from the Stem or Arms, and covering it with Loam mingled with rich Earth, they will shoot their Fibres, and may be seasonably separated; but to accelerate this, apply a *Ligature* above the Place when the Sap is ascending, or beneath when it descends: From *June* to *November* you may lay them; the Scrubs less erect, do excellently to thicken Coppices, and will yield lusty Shoots, and useful Fire-wood.

The *Lime* affects a rich feeding loamy Soil, where they will grow incredibly for speed and spreading: They may be planted as big as one's Leg, their Heads topp'd at about six or eight Foot bole; thus they become of all other the most proper and beautiful for Walks, as producing an upright Body, smooth and even Bark, ample Leaf, sweet Blossom, and a goodly Shade, at the distance of eighteen or twenty Foot: They are also very patient of Pruning, and may be elipt into any Shape, tho' the *Conical* is that it most affects; but if they Taper over much, some collateral Boughs should be spared to check the Sap, which is best done about *Midsummer*; and to make the Tree grow upright, take off the prepondering Branches with Discretion, and so indeed you may correct any other Tree, and

and redress its *obliquity*. The *Root* in transplanting must not be much lop'd; which is also a good lesson for all young planted Trees: And the distance for Walks and Avenues may in rich Ground be twenty Foot, in a more ordinary fifteen or sixteen Foot.

The *Eleſtor Palatine* did at *Midsummer* remove very great *Lime-Trees* from one of his Forests to a steep Hill, exceedingly expos'd to the Sun, at *Heidelburgh*: They grow behind that strong Tower on the *South-West*, and most torrid part of the Eminence; being of a dry, reddish, barren Earth; and yet do they prosper very well: But the Heads were cut off, and the Pits into which they were transplanted were fill'd with a Composition of Earth and Cow-Dung, which was exceedingly beaten, and so diluted with Water, as it became almost a *liquid Pap*: In this were the Roots plunged, covering the Surface with the Turf, which is a singular Example for others to follow and imitate.

Other Perfections of that Tree (beside its *unparallel'd* Beauty for Walks) are, that it will grow in almost all Grounds; that it *lasts* long, it soon *heals* its Scars, it stoutly resists a Storm, and seldom becomes *hollow*. Those Royal Plantations of these Trees, in the Parks of *Hampton-Court* and *St. James's*, will sufficiently instruct how these and all other single Trees are to be govern'd and defended from Injuries till they are able to protect themselves: Some shelter them with three or four *Deal Boards*; which yet is not so much approv'd of, by reason it keeps them from the free Air.

Sir *Thomas Brown* of *Norwich* gave an Account of a *Lime-Tree* at *Depeham* in *Norfolk*, that in the least part of the Trunk (which was about two Yards from the Ground) was at least eight Yards and a half in Circumference; about the Root near the Earth sixteen Yards, and about half a Yard above that, about twelve Yards: The height to the uppermost Boughs about thirty Yards.

The Timber of a well grown *Lime*, is convenient for any use that the Willow is; but much to be prefer'd, as being both stronger, and yet lighter; and therefore fit for Yokes, and Boxes for the Apothecaries: Because of its colour, and easy working, and that it is not subject to Split, Architects make with it Models for their designed Buildings; and small Statues, and little curious Figures have been carv'd of this Wood: With the Twigs, Baskets and Cradles are made, and of the smoother side of the Bark, Tablets for Writing. The *Grecians* made Bottles of it, which they finely rozin'd within side.

The *Gravers* in Wood do sometimes make use of this fine Material; and even the coarsest Membrane, or Slivers of the Tree, growing between the *Bark* and the main *Body* they now twist into *Bass-ropes*; besides, the *Truncheons* make a far better Coal for Gunpowder than that of *Alder* itself: And the extraordinary *Candor* and *Lightness* of this Wood, has dignified it above all the Woods of our Forest in the Hands of the Right Honourable the *White-staff* Officers of the Court.

As to the Virtues of this Tree, it is of admirable Effect against the *Epilepsy*; for which the delicately scented Blossoms are held prevalent. The *Berries* reduc'd to Powder, cure the *Dysentery*, and stop Blood at the Nose: The distill'd Water is good against the *Apoplexy*, *Vertigo*, *trembling* of the Heart, *Gravel*, &c. And some use a Medicine made of the Bark for Wounds and other Distempers.

The SYCAMORE-TREE.

MR. *Evelyn* calls the *Sycamore* the *Acer majus* or a sort of *Maple*. It is multiplied very readily by its own Seed or Keys, which it bears in a plentiful manner, and come up the first Spring after sowing. They may also be propagated by *Suckers* or *Layers*, but the *first* way is the best.

They bear transplanting very well, and therefore may be removed of any size, provided the Head be lopp'd and made something proportionable to the Root. Only it being a spongy Wood, the greater Wounds should be covered with Clay, mixt with a Cow-dung. It is a Tree mightily propagated and planted in the Bishoprick of *Durham*; where it thrives and resists the strongest Winds this Country is subject to: And besides, not being fit for any of the uses of the *Waggon-ways* for Coals, they have escaped the common plunder and demand for Timber; which is *almost* the only thing desirable in Life this Country is destitute of for real Use and Ornament.

These Trees however present themselves frequently in Hedge-Rows, and are an excellent defence against the Winds, especially near the Sea where hardly any other Tree will grow. One would not chuse to Plant them near fine Walks and Gardens, because their large Leaves are apt to defile them; and it is also observed that they breed many Insects from the Honey-dew which this Tree is apt to retain; and *therefore* so friendly and kind to the *Bees*.

Of this Wood the Turner makes *Trenchers* and *Dishes*, being *soft* and *white*. And it is not less useful for Cart and Plough Timber, being *light* and *tough*. The Sap will run from this Tree in great plenty, when the Bark is opened, and some think it as wholesome as *Birch*, when mixt with Malt, and made into strong Beer.

What follow next are Trees of an humbler Size.

ALDER-TREES.

THE *Alder* is a *Coniferous* Tree, bearing small Cones; and grows in watery Places, having Leaves of a dark Green, undulated and shaped like those of the *Nut-Tree*.

'Tis of all other Trees the most faithful Lover of *Watery* and *Boggy* Places, and those most despis'd *weeping Parts* or Water-galls of Forests. They are propagated of *Truncheons*, (for so they raise them in *Flanders*, and make wonderful profit of the Plantations) like the Poplar; or of Roots; which way Mr. *Evelyn* prefers, being set as big as the small of ones Leg, and in length about two Foot, whereof one should be plunged in the Mud: This profound fixing of *Aquatick-Trees* being to preserve them steady, from the Concussions of the *Winds*, and violence of the *Waters*, in their *liquid* and *slippery* Foundations. They may be placed at four or five Foot distance, and when they have struck Root, you may cut them, which will cause them to spring in *Clumps*, and to shoot out into many useful *Poles*. But if you Plant smaller Sets, cut them not till they are arrived to some competent bigness, and that in a proper Season; which is a Rule for all the *Aquaticks*, and soft Woods; not till Winter be well advanced, in regard of their pithy Substance: Therefore, such as you have occasion to make use of before that Period, ought to be well grown, and felled with the earliest, that so the successive Shoots receive no Prejudice.

There is another way of planting *Alders*, after the *Jersey* manner; viz. by taking Truncheons of two or three Foot long, at the beginning of Winter, and bind them in *Faggots*, and place the ends of them in Water till towards the Spring, by which Season they will have contracted a swelling *Spire* or *Knur*, about that part, which being set does never fail of growing and striking Root. There is also a *black sort* more affected to Woods and drier Grounds.

Some advise to plant Shoots of Alder, and so of all the *swift growing* Trees, being of seven Years growth; sloping off both the ends towards the Ground, to the length of a *Billet*, and burying them horizontally a reasonable depth in the Earth: This will cause them to put forth seven or eight Branches, each of which will become a Tree in a short time, especially if the Soil be moist. The distance for Alder-Plantations, ought not to be more than five Foot at first; since every felling renders them wider for the benefit of the Timber, even to thirty and forty Foot in five or six Fellings.

You may cut *Alder* and other *Aquatick-Trees* every third or fourth Year; and some do it more frequently: They should also be abated within half a Foot of the principal Head, to prevent the perishing of the *Main Stocks*; and to accelerate their Sprouting. And the laying of *Truncheons* in *Water* for a while, after they are fitted to the Size, is generally approv'd to be a good Method to prepare them.

Some weakly enough extirpate these *Trees* from their *Boggy* Places, and yet know not how to turn them to better use. The Shadow of this Tree doth nourish the Grass growing under it; and being set and well plash'd, is an excellent defence to the Banks of Rivers; so that *Authors* have wondered it is not more practis'd about the *Thames*, to fortify and prevent the mouldring of the Walls and Banks from the violent Weather they are expos'd to.

Of old they made Boats of the greater parts of these Trees, and excepting *Noah's Ark*, the first Vessels we read of were made of this *Wood*. And as then, so now, are our overgrown *Alders* frequently sought after for such Buildings as lye continually under Water, where it will *harden* like Stone; whereas being kept in any *unconstant* Temper it *rots* immediately. *Vitruvius* tells us that the *Morasses* about *Ravenna* in *Italy* were piled with this Timber, to superstruct upon: And it was used under that famous Bridge at *Venice*, the *Rialto*, which passes over the *Grand-Canal*, bearing a vast Weight.

The Poles of *Alder* are as useful as those of *Willows*; but the *Coals* far exceed them, especially for *Gun-powder*: The Wood is useful for *Piles*, *Pumps*, *Hop-poles*, *Water-pipes*, *Troughs*, *Sluices*, *Small Trays*, and *Trenchers*, *Wooden-beels*, &c.

The Bark of *Alder* is precious to Dyers; and some Tanners and Leather-dressers make use of it; and with it and the Fruits (instead of Galls) is compos'd an Ink; for if mace-

rated in Water, with a little rust of Iron, it makes a black Dye, which may be likewise used for Ink. The interior Rind of the *Black Alder*, purges all *Hydropic* and *serous* Humours; but it must be dried in the Shade, and not used *Green*; and the *Decoction* is to settle two or three days before it be drunk. Being beaten with Vineger it heals the Itch.

BIRCH-TREE.

THIS is a Tree bearing its Seeds in *single Teguments* or Coverings, of small Leaves, having slender *reddish* Twigs, with *smooth* and *white* Branches.

The *Birch* is said to be a *Natural Tree* of *England*; and is altogether produced of *Roots* and *Suckers*, (tho' it sheds a kind of Seeds like the *Elm* about the Spring) which being planted at four or five Foot interval, in small Twigs, will suddenly rise to Trees, provided they affect the Ground, which cannot well be too *barren*: For it will thrive in the *dry*, *wet*, *sandy* and *stony*, and even in *Marshes* and *Bogs*; the *Water-galls* and *Uliginous* or *Moorish* Parts of Forests, that will hardly bear any Grass, do many times *spontaneously* bear it in abundance, whether the Situation be high or low, and nothing comes amiss to it. Plant the small Twigs or Suckers having Roots, and after the first Year cut them within an Inch of the Surface; this will cause them to sprout in strong and lusty *Tufts*, fit for *Coppice* and *Spring-Woods*; or by reducing them to one Stem, you may render them in a very few Years fit for the *Turner*.

Though Birch be the *worst* of *Timber*, yet it is used for *Ox-yokes*; also for *Hoops*, *Panniers*, *Brooms*, *Wands*; *Arrows*, *Bolts*, *Shafts*, *Dishes*, *Bowls*, *Ladles*, and other *Domestick Utensils*. In *New-England*, our *Northern Americans* make of it *Canoo's*, *Boxes*, *Buckets*, *Kettles*, and *Dishes*, (which they sew, and join very curiously with Thread made of *Cedar-Roots*) and divers other Utensils, whereof they have a blacker kind: They make also small-craft *Pinnaces* of *Birch*, ribbing them with *white Cedar*, and covering them with large Flakes of *Birch-Bark*: They sew them with Thread of *Spruce-Roots*, and pitch them as we do here in *England*.

This Wood is useful for *Fuel*, great and small *Coal*, which *last* is made by charring the slenderest Brush and Summities of the Twigs: The inner Bark was anciently used for *Writing Tables*, before the Invention of *Paper*; and with the outward and thicker Bark are divers Houses in *Russia*, *Poland* and other *Northern Tracts*, covered instead of *Tile*. Of the *whitest* part of the old Wood, found commonly in doating *Birches*, is made Grounds for sweet Powder; and of the quite consum'd and rotten Trees is made the best *Mould* for raising of divers Seedlings of the rarest Plants and Flowers. Neither should it be forgotten, that from this Tree a Liquor is drawn which mixt with a due quantity of *Sugar* makes excellent *Wine*: And being skilfully tapp'd in *March*, there will flow from it, betwixt the Wood and the Bark, an incredible Quantity of Juice very *palatable*.

HAZEL-TREE, and FILBERT.

THE *Hazel* is a *Nuciferous*, *European Tree*, containing in a common Husk, one Nut, open at one End, being smaller Trees than *Walnut* or *Almond*, of broad indented Leaves, bearing *Catkins*; of a lesser Kernel and thicker Shell than *Filberts*, and whole Husk is shorter.

It is best raised from the *Nuts* (altho' they are also rais'd by *Suckers* and *Layers*) which sow like Maist, in a pretty deep Furrow towards the end of *February*; or treat them as directed for the *Walnut*: Light Ground may be immediately sown and harrowed in, very accurately; but if *Clay*, plough it earlier, and let it be sufficiently mellow'd with the Frosts; and then the third Year cut your Trees near to the Ground with a sharp Bill.

But for a Grove for Pleasure, plant them in *Fosses* at a Yard distance, and cut them within half a Foot of the Earth, dressing them for three or four *Springs* and *Autumns*, by only loosening the Mould a little about their Roots. Others set the Nuts by Hand, at one Foot distance, to be Transplanted the third Year at a Yard asunder: Do this when Winter is far advanc'd; because they are exceedingly obnoxious to the Frosts; nor will they sprout till the *Spring*; and *Vermin* greatly devour them: Preserve them therefore moist, not mouldy, by laying them in their own dry Leaves, or in Sand, till *January*.

From this Management they thrive very well, the Shoots being like small *Wands* and *Switches*, or somewhat bigger; and such as have drawn divers hairy Twigs, are by no means to be disbranch'd, no more than their Roots, unless by a very spating and discreet Hand:

Hand: Thus your Coppice of *Hazels* Being planted about *Autumn*, may be cut within three or four Inches of the Ground, the Spring following. Mr. *Evelyn*, would spare them two or three Years, when they have strong hold, and may be cut close to the Earth; the *unprosperous* and *feeble* ones especially. Filberts are thus to be treated, and both of them much improv'd by Transplanting; but chiefly by Grafting on the common *Hazel* raised from Seed.

For the place of Growth, they above all affect cold, barren, dry and sandy Grounds; Mountains, and even *Rocks* will produce them; but more plentifully, if somewhat moist, and mossy; they will grow well on sides of Hills, or Hedge-Rows.

Such as are maintain'd for Coppices may after twelve Years be fell'd the first time; the next at seven, or eight, &c. for at this Period their Roots will be compleatly *vigorous*. You may plant them from *October* to *January*, provided they are carefully weeded, till they have taken first hold; and there is not among all our Store a more profitable Wood for Coppices. N. B. Those who set Nuts, should by picking get the *largest* they can find

There is a compendious Expedient for the thickning of Coppices, which are too *transparent*, by laying of a *Sampler* or Pole of an *Hazel*, *Ash*, &c. of twenty or thirty Foot in length (the Head a little lopp'd) into the Ground, giving it a chop near the Foot, to make it lye *easy*; this fastened to the Earth with a *Hook* or two, and covered with some fresh Mould at a competent depth, will produce a great many *Suckers*, thereby furnishing a Coppice very speedily.

The use of the *Hazel*, is for *Poles*, *Spars*, *Hoops*, *Angling-Rods*, *Faggots*, *Coals*, &c. and it makes one of the *best Coals*; once us'd for *Gun-powder*, being very fine and light, till *Alder* was found to be more fit: Also it is much us'd for *Riding Switches*, *Hurdles*, &c. of which last *Walls* are made, instead of *Laths* and *Puncheons*, super-induc'd with a course Mortar made of Loam and Straw: These Walls inclose divers Cottages, Sheds and Out-houses in the Country, being strong and lasting; and ample Inclosures of Courts and Gardens have been so secured. This is practis'd much in *Bedfordshire*.

There is no *Wood* which purifies *Wine* sooner than the Chips of *Hazel*.

The HORN-BEAM.

THE *Horn-Beam* is but of one kind, and is generally admired for its Shade and the pleasant *Verdure* of its Leaves. It is moreover greatly respected for its early pushing forth, and holding its Leaves a long Time; for even after they have lost their Colour they continue on the Tree till new ones thrust them off. By which means it becomes very valuable for *Espaliers* that are to defend the tender Plants from external Violence: It is also the most *conspicuous* Plant, and bears well the discipline of the Sheers, so as to become almost an *impenetrable* Defence. One of the greatest Beauties of the fine Gardens at *Versailles* is thought to consist in the *Tallness*, and exact *Regularity* and *Beauty* of these Hedges; and in *Italy* the finest Grotto's and Wilderesses are made with them.

But as it is good for Hedges, so also, if it is neglected, it becomes an useful *Forest-Tree* for Shade; and they make excellent *Pollards*. Both the Rhind and Wood is *rough* and *hard*, and of a *whitish* Colour. It bears Flowers in the form of Strings, which consist of several little Leaves fastened about it like Shells, and underneath are several *Stamina*.

It may be raised either of *Seeds*, or increased of *Layers*. But so far as the Seed lieth in the Ground a whole Year before it peeps, (as the *Ash* and *Holly*) the best way to raise it, is either from *Layers* or rather from *Setts*, which are easily procured in the Woods where they grow, being apt to stool with *Suckers* from the Root.

There are few Soils which they refuse, both *Hills* and *Dales* suit them, and they will grow even where they are over-topp'd and dropt on by larger Trees; and yet few Trees make more haste in growing. The Timber of this is useful for *Mill-Cogs*, &c. exceeding all others for such sort of Uses. It is good also for *Yoke-Timber*, *Heads of Beetles*, and *Handles for Tools*, and for the *Turners* use, being *rough* and *white*. It makes excellent *Billeting*, and is fit Fuel for a *Lady's Chamber*.

MAPLE-TREE.

THE *Maple* is a Tree bearing its Seeds in single Teguments or Coverings, that are *Membranaceous*; the Seed-Vessels or Keys being double, and having small Leaves divided into five Segments, and 'tis a *brittle* Wood.

This *Maple*, of which Authors reckon several kinds, was of old held in equal Estimation almost with the *Citron*; especially the *French Maple*, and the *Peacock's-tail Maple*, which is elegantly *undulated* and crisp'd into variety of *Curls*; the *Maples* we have in *England* differ very little, and they are produc'd of the Keys like the *Ash*, and like to it affect a *sound* and *dry* Mould; growing both in Woods and Hedge-Rows, especially in the latter, which if the Ground be rather hilly than low, afford the fairest Timber. It is also propagated by *Layers* and *Suckers*: By shredding up the Boughs to a Head, it will shoot to a great Height in a little Time; but if you will Lop it for the Fire, do it in *January*; keep no Pollards or spreading Trees, for a clammy Dew falls from them, that hurts what grows under.

The Timber is far superior to *Beech* for all the uses of the Turner, who seeks it for *Dishes*, *Cups*, *Trays*, *Trenchers*, &c. as the Joyner, for *Tables*, *Inlayings*, and for the delicateness of the Grain, when the *Knurs* and *Nodosities* are rarely *diaper'd*, which does much advance its Price. Also for its *lightness*, it is employ'd often by those who make *Musical Instruments*. The larger sort of it we call the *Sycomore*, but the description of this *lesser Maple*, and the ancient Value of it, is worth the citing.

The *Maple* (says *Pliny*) for the Elegancy and Fineness of the Wood, is next to the very *Cedar* itself: There are several kinds of it, especially the *white*, which is wonderfully beautiful; this is call'd the *French Maple*: The other has a curl'd Grain, so curiously *maculated*, that from a near resemblance it was usually call'd the *Peacock's-tail*, &c. The *Bruscum* or *Knur*, is wonderfully fair, but the *Molluscum* is counted most precious; both of them knobs and swellings out of the Tree: Large Planks for Tables were of old prefer'd to *Cedar* and *Citron*; but now they are used only for small *Table-Books*; and with its thin Boards, Bed-headers are wainscotted.

The *Bruscum* is of a blackish kind, with which they make Tables. *Cicero* had a Table of this Wood which cost him Ten thousand *Sesterces*: Such another had *Asinius Gallus*. That of King *Juba* was sold for 15000; and another we read of for 140000. *II. S.* which at 3 *d.* *Sterling* arises to about 1750 *l.* and yet that of the *Mauritanian Ptolomy*, was far richer, containing four Foot and a half Diameter, and three Inches thick, which is reported to have been sold for its Weight in Gold.

The *Knot* of this Timber was most esteem'd; which is much resembled by the *Female Cypress*; and we have now as beautiful Planks of some *Walnut-Trees*, near the Root; but the great Art, in ancient Times, to make the *Maple*, &c. so exceeding fine, was in the *Seasoning* and *Polishing*.

There have been some *Maples* of large Bulk and noble Shades: *Virgil* chose it for the Court of his *Ervander*, one of his worthiest Princes, where in his best of Poems he describes him sitting in his *Maple-Throne*; and when he brings *Aeneas* into the Royal Cottage, he makes him this great and memorable Compliment.

*This humble Roof, this rustick Court, said he,
Receiv'd Alcides crown'd with Victory:
Scorn not (great Guest) the Steps where he has trod,
But contemn Wealth and imitate a God.*

The *Romans* were madly luxurious for buying Tables and other Furniture at very great Rates; and when they at any time reproached their Wives for their expensiveness in *Pearl* and other rich *Trifles*, they were wont to retort and turn the Tables upon their Husbands

The SERVICE-TREE, or SORBUS.

SOME fancy there are several kinds of this Tree, but we find little difference in *England*, only that some of them bear a larger Berry than others, which perhaps is more owing to the *Soil* than the *Sort*.

It bears a Cluster of white Blossoms in the Spring, which seldom fail to afford so many Berries in *Autumn*, something bigger than Haws, which after they come to appear rotten in *October*, are eaten with great greediness by many, having a pleasant and grateful Acidity: But they are not reckoned wholesome for some Constitutions, as they are in a great degree *costive*. They may be raised from the Berries; but the best and quickest way is from *Suckers*, which they put forth very plentifully. They may be transplanted of any bigness; and if they are *headed*, the Wound will quickly heal up. You cannot fail to furnish your self with any quantity from the Woods, where they naturally grow, and are a proper Stock whereon to graft either the *Medlar* or *L'Azzero*; of which more anon.

The *Timber* (for they will sometimes grow large) is useful for the *Joyner* and *Turner*, for *Bows*, *Pullies*, *Screws*, *Mills*, *Spindles*, *Pistol* and *Gun-Stocks*, being of a very fine Grain, and if assisted with some boiled *Linseed Oil*, will be made to counterfeit *Ebony* and most of the *Indian Woods*. This Tree makes an early Appearance in the Spring, both with its Leaves and Blossoms, and therefore should be planted within View for its Beauty. It cures the *Green-Sickness*, distill'd in Water.

The WILD PEAR, and the CRAB.

THESE are both of them *Forest-Trees*, and will arrive to a considerable Stature from the Kernels of both; from which are produced great Varieties in their Fruit by a kind of *Lusus Naturæ*. The *Wild Pear*, is long before it bears any Fruit from the Seed; but it afterwards amply rewards that *Laziness*, by annual and plentiful Crops; of the Fruit is made in some Countries a most delicious Liquor called *Perry*, which is esteemed to be equal to most of the *French White-Wines*, both in strength and goodness; especially if it be kept three or four Years. But it is seldom suffered to come into private Hands abroad; for the Vintners in *London* greedily buy it, and fetch it from *Herefordshire*, and some parts of *Gloucestershire*, to mix with some of their strongest *Spanish Wines*, as they do also some of the richest *Cyders*; the best of which Liquor is also made from Apples never grafted, but raised from the Seed; which tho' they retain an unpleasant roughness to the Taste from the Tree; yet make better and richer *Cyder*, than the best of the eating Apples grafted.

The Wood of these Trees, especially the *Pear*, bears an excellent smoothness and politure in all sorts of *Wooden Ware*; and the Joiner covets it much for *Tables*, *Chests* of *Drawers*, and *Wainscot*. The Wood of the *Crab* is very tough, and is much used by the Farmer for *Flails* to beat out Grain, and for *Cudgels* or *Walking-sticks*; especially such as are used in a way of *Discipline*. The very worst and smallest Fruit of the *Crab* affords a *Verjuice* mighty useful in the Kitchen; and in most sorts of *Condiments*, is thought much better than *Vinegar*.

The MULBERRY.

OF this Tree I shall say little here, having already spoke of it in the Fruit-Garden. There are two sorts of it, the *Black* and the *White*. The *first* is a slower, the *last* a much quicker Grower. They both bear *Catkins*, producing *Male* and *Female* Blossoms at the same time. But because the *White Mulberry* bears a less and more indifferent Fruit, but is yet the quickest Grower, it is advisable to graft the *Black* upon the *White*, to accelerate its growth, and to mend the Fruit. It is raised from the *Seed*, from *Suckers*, and from *Cuttings*, set in a shady Place. They love a light and warm Soil, where they will grow to be very large, and make an handsome Shade in the four Summer Months amongst the *Forest-Trees*. The best time for transplanting them is in *Autumn*. But they should be carefully taken up, having long Roots, and yet as few of them as possible should be taken off. It need not be repeated how useful these Trees are to the *Silk-Worm*, and what Profit might accrue to the Nation, if the Culture of them was more encouraged, and the *Silk Trade* put into a right method of Manufacture. Of which more in another Place.

CHESNUT-TREE.

THIS is a *Nuciferous, European Tree*, containing in one common Husk several Nuts, whose outward Husks is *echinate* and *prickly*; and hath *long, smooth, deeply indented* Leaves, its Husks containing three or four Nuts.

Pliny reckons many kinds of *Chestnuts* about *Tarentum* and *Naples*; but we commend those of *Portugal* and *Bayonne*, chusing the largest, brown and most ponderous Fruit; but the lesser ones to raise for Timber: They are produced best by *sowing*; previous to which, let the Nuts be first spread to *sweat*; then cover them in Sand; a Month being past plunge them in Water, reject the Swimmers; being dry, for thirty Days more sand them again, and water them as before: Being thus treated till the beginning of Spring or in *November*, set them like Beans, and as some do, *drench'd* for a Night or more in *new Milk*.

They are to be put into the holes with the Point *upmost*; one in a hole will do, if try'd as before, nor will any of them fail, unless by some Accident: But being come up, they thrive best unremoved, making a great Stand for at least two Years, upon every *transplanting*; yet if needs you must alter their Station, do it about *November*, and that into a light Ground, or moist *Gravel*; tho' they will grow in *Clay, Sand*, and all mixed Soils, upon exposed and bleak Places, and the pendent Declivities of Hills to the *North*, and in dry airy Places; and sometimes they thrive near *Marshes* and *Waters*; but they affect no Compost, save what their own Leaves afford them, and are more patient of *Cold* than *Heat*: As for the sowing in the Nursery, treat them as you do the *Walnut*.

If they are set in *Autumn* or *Winter*, it is best to inter them within their Husks, which being every way arm'd, are a Protection against *Mice*, and other *Vermin*, which would destroy them. Some sow them confusedly in the Furrow like the *Acorn*, and govern them as the *Oak*: But then should the Ground be broken up between *November* and *February*; and when they spring, be cleansed at two Foot asunder, after two Years growth: Likewise *Coppices* of *Chestnuts* may be wonderfully increased and thickened by Laying the tender and young Branches; but such as spring from the Nuts are best, and will thrive exceedingly, if (being let stand without removing) the Ground be stirr'd, and loosened about their Roots, for two or three of the first Years, and the superfluous Wood prun'd away; and indeed for good Trees they should be stripp'd up after the first Year's removal; they also shoot into very good *Poles* from a felled Stem: Thus will you have a *Coppice* ready for felling, within eight Years, which (besides many other uses) will yield incomparable *Poles* for any Work of the *Garden, Vineyard, &c.* till the next cutting: And if the Trees like the Ground, will in ten or twelve Years grow to a kind of Timber, and bear plentiful Fruit.

Chestnuts have been transplanted as big as a Man's Arm, their Heads being cut off at five or six Foot high; but they came on *at leisure*: In all Plantations for Avenues, you may set them from thirty to ten Foot distance, though they will grow much nearer; when tender, you cultivate them like the *Ash*, the Nature of whose Shade they resemble, since nothing affects much to grow under them: Some say that the young *Chestnut* Trees should not be prun'd or touched with any Edge-tool, for the first three or four Years, but rather cropp'd or broken off, which is left to Experiment.

The *Chestnut* being grafted in the *Walnut, Oak, or Beech*, it is said will come exceeding fair, and produce incomparable Fruit: And it is wish'd we did more universally propagate the *Horse-Chestnut*, which being easily increas'd from Layers or from the Seed, grows into a goodly Standard, and bears a most glorious Flower, even in our cold Country, but a very nauseous Fruit; as may be seen at Sir *William Ashurst's* at *Highbury*, and several other Places, but especially at the Bishop of *London's* at *Fulham*.

The *Chestnut* was first brought from *Constantinople* to *Vienna*, thence into *Italy*, whence it was propagated in *France*, and thence among us. It is (next the *Oak*) one of the most sought after by the *Carpenter* and *Joyner*; and it formerly built a good part of our ancient Houses in *London*: This Tree affords the best *Stakes* and *Poles* for *Palisadoes, Pediments* for *Vine-Props*, and *Hoops*; also for *Mill-Timber* and *Water-Works*, or when it may be buried; but if *Water* touch the Roots of the growing Trees, it spoils both Fruit and Timber. The Timber does well for *Columns, Tables, Chests, Chairs, Stools, Bedsteads*, for *Tubs* and *Wine-Casks*, which it preserves with the least Tincture of the Wood of any whatsoever: If it be dipp'd in scalding Oil, and well pitch'd, it becomes exceeding durable; but otherwise, contrary to the *Oak*, it will make (like many other things in the World) a fair show outwardly, when it is all rotten within.

As to the Fruit of this Tree, 'tis best to *beat* it from the Trees, some little time before they are ready to fall of themselves; thus they will keep the better; or else you must *smoke-dry* them: They are commended highly for Food, and the best Tables in *France* and *Italy* make them a *Service*, eating them with Salt in Wine, or Juice of Lemon and Sugar; being first *roasted* in Embers. They are here used in stewed Meats, &c. by our *French* Cooks; and they are best preserved in Earthen-Vessels, in a cold Place; some lay them in a Smoke-Loft, others in dry *Barley-Straw*, *Sand*, &c. The way of eating them in *London*, is by *boiling* them till somewhat soft, which will make the Shells come off easily, and then we eat them either hot or cold: If thus prepar'd they were eaten with Butter, Vinegar and Pepper, as we eat *Potatoes*, there is no doubt but that they would be an acceptable Dish.

The Leaves of the *Chestnut-Tree* make very wholesome *Mattresses* to lye on; and they are good *Litter* for Cattle: The Coals of this Tree are excellent for the Smith, being soon *kindled*, and as soon *extinguish'd*; but the Ashes will *stain* Linnen, if a Lee be made of them and it is washed therein. The *Flower of Chestnuts*, is an approv'd Remedy against *Spitting of Blood*, and the *Cough*, being made into an *Electuary* with Honey.

The WILD CHERRY, Black and Red.

THERE are two sorts of the *Wild Cherry*, which bear Fruit very plentifully, Black and Red, and which grow to be large *Timber* Trees. They grow frequently and naturally in the Hedge-Rows in *Berkshire*, *Hertfordshire*, and in several other *Counties*; from whence the Fruit is carried in great Abundance to other Parts destitute thereof. It is valued by *most* as an excellent Fruit eaten raw, and by *all* allowed to be very *wholesome*.

There is hardly any other way to preserve some of the Fruit from the Birds, but by planting a good number of Trees, and then some will fall to the Owner's share; especially if the *Black-Birds* and *Thrushes*, be a little kept in Awe with the Gun at the time of ripening. They make a well-shaped and beautiful Tree for Avenues, and therefore should be more encouraged and planted than they are; for they prosper almost in any Soil, but chiefly disdain the two Extremes of *Sand* and *Clay*.

They are raised either from the *Stones* or *Suckers*, but the *first* way is by much the *best*, *earliest*, and *most natural*; and they may be removed (with care) almost of any size. The Wood is excellent and useful for all or most of the purposes mentioned under the Head of the *Wild Pear*.

The QUICKEN, or QUICK-BEAM.

THIS Plant affects the dry Places or Banks of Woods and Groves, by some called the *Irish* or *Wild Ash*, from the resemblance its Leaves and Bark have to the common *Ash-Tree*. Though the Leaves are a little more jagged on the edges, and something smaller and longer in proportion to its bigness. It doth not bear Keys, but most beautiful *Scarlet* Berries in Clusters, which look very ornamental, and make a fine Shew at a distance all the Winter long: And even the Blossoms in the Spring have a very fragrant smell.

They are easily raised from these *Berries* or from *Suckers*; and will endure well the Severities of the Cold and *Northern* Blasts, being a very hardy Tree, and therefore worth propagating, for the two reasons above, for its *Beauty* and *Strength*; and also that is a proper Stock for the *Service*, the *Medlar*, and the *L'Azzerole*, to be grafted upon.

It is a very *tough* Wood, and all *Heart*, therefore useful for the Wheelwright, and to the Husbandman for most of his necessary Tools. Mr. *Evelyn* says, the *Berries* fermented by themselves make an excellent Drink against the *Spleen* and *Scurvy*.

The WHITE and BLACK THORN, and GLASSENBURY THORN.

THES E come into the Catalogue of the Trees of the *Forest*, because they so frequently mix with them, and sometimes come to a considerable Stature; tho' their uses are otherwise better known, especially that of the *White Thorn*, for *Mounds* and *Hedges*. The *Black Thorn*, is indeed a perfect *Weed*, running quickly over a Ground from its *Roots* and *Suckers*, and therefore is not to be encouraged any where but in Coppices as *Under-wood*. But the *White Thorn*, as a Standard, mixes well enough, and answers very well for Lop as a Pollard, amongst the *Forest-Trees*. It is raised from the *Haws*, which lie in the Ground a whole Year before they peep. The Wood is *white*, *hard* and *tough*, and therefore fit for many uses.

As to the *Glassenbury Thorn*, it differs from the other Thorns only in this; that as *they* blossom in *Summer*, *this* sooner or later blossoms in *Winter*. It takes its Name from the Monastery at *Glassenbury*, where it is reported it was first discovered. This Tree was many Years since planted in *Wilton Garden* near *Sarum*, and I think it is there now. It must not be expected it should be as exact in the *Time of Blossoming* as it was supposed to have been at the Old Monastery from whence it came, *viz.* on *Christmas-Day*.

The WILLOW, SALLOW, and OZIER.

THES E Trees are also well known and so easily raised, that there needs very little to be said concerning them. They all delight in low moist Grounds, especially the *Ozier*: For the *Withy* and the *Sallow*, will also grow upon the driest Land. The best time both to transplant and to lop them is in *February*, just before the Sap begins to rise: For they are to be raised of *Truncheons*, and to be kept from the rubbing of Cattle, by Bushes ty'd about them. The *Truncheons* of the *Withy* and *Sallow*, should be left about eight or ten Foot high, and have all their Budds rubb'd off, but what may serve to form a Head at the top: But those of the *Ozier*, should only just appear with their Heads above Ground.

The Wood of the *Withy* and the *Sallow*, are very serviceable for the Fire in a scarce Country of Wood. For (as the common Saying among the Country-men is) these will purchase an *Horse*, sooner than an Oak will a *Saddle*. They make excellent Stakes for *Hedges*, where they will grow and thicken; of these are made *Rake* and *Scythe Handles*, *Clogs*, *Pattens*, *Hurdles*, and *Sieves*. And the *Oziers* are peculiarly serviceable for all sorts of *Baskets*, *Hampers* and *Panniers*. Insomuch that an *Ozier Ground* (for it produces a Crop every Year) is reckoned of more value than the same quantity in Tillage. I have heard of some that have been Let for eight or nine Pounds a Year *per Acre*. Which considering the constant Crop, the little Charge that attends them, the Easiness of renewing the old Plants when decayed, by sticking in Pieces of the last Year's Shoots, and witrhal, that they grow where almost nothing else will grow, this must be thought one of the *best* Improvements of *bad Land*.

WILLOW-TREES

THE *Willow* is a Tree bearing imperfect Seeds in single Teguments or Coverings, and this Seed is contain'd in Catkins, call'd *Juliferous Trees*, and is of the longer Leaf, and of a soft Wood, growing most naturally in moist Places; having its Leaves more dense and compact than the *Sallow*, and being the larger Tree.

Our common *Willow* is of three kinds, the *White*, and *Black*, and *Sweet-scented*: The *White* is also of two sorts, the one of a yellowish, the other of a brownish Bark: All of them are planted of *Stakes*. The *White* delight in Meads and Ditch-sides, rather *Dry* than *over-Wet*; yet the *Black* and *Reddish*, do well in more boggy Ground. When they are planted, let holes be made for them, rather than be forced in with too great Violence, and they must be *soak'd* in Water two or three days before they are planted, and done in *February*, the Mould being well closed to them.

By good Management there may be made very profitable Coppices of these Trees: They may be grafted betwixt the Bark, or budded, and then they become so beautiful as to be fit for some kind of delightful Walks. In low and marshy Places, they may be ordered so

as in eleven or twelve Years to yield a hundred Load of Wood in an Acre : It is the sweetest of all our *English* Fuel, provided it be sound and dry.

The third is the *Garden Willow*, which produces sweet and beautiful Flowers, which may be set for Partitions of Squares ; but they have no Affinity with others : There is in *Shropshire* another very odoriferous kind, extremely fit to be planted by pleasant *Rivulets*, both for Ornament and Profit ; it is propagated by Cuttings or Layers, and will grow in any dry Bottom, so it be shelter'd from the South, affording a wonderful and early Relief to the industrious Bee.

What most of the former kinds differ from the *Sallows*, is not much considerable, they being generally useful for the same purposes ; as for *Apothecaries* and *Goldsmiths Boxes*, *Saddle-Trees*, *Gun-Stocks*, *Half-Pikes*, *Harrowes*, *Shoe-makers Lasts*, *Heels for Shoes*, *Clogs*, *Forks*, *Rakes*, &c. *Perches*, *Hop-Poles*, *Supporters for Vines*, *Hurdles*, *Sieves*, *Nine-Pins*, *Tops*, *Platters*, little *Casks*, *Fruit-Baskets*, *Cans*, *Trenchers*, and other *Ustensils* : The larger sound Trees make excellent Boards for Wainscoting, and the Boughs make good Coals ; nay, the fresh Boughs, (which of all the Trees yield the coolest Shade in the hottest Season of the day) are fit to be placed about the Beds of feverish Persons. The Wood preserv'd dry, will endure a long time ; but what's wholly putrify'd, and reduced to a loamy Earth in the hollow Trunks of superannuated Trees, is of all other the fittest to be mingled with fine Mould, for raising our choicest Flowers, such as *Anemonies*, *Renunculus's*, *Auricula's*, and the like.

The TAMARISK.

THE *Tamarisk* is a Tree usually planted for Variety ; and is useful in some parts of Physick. It may be raised either of Layers, Slips, or Suckers. It grows tall like the *Cypress*, and will bear to be shorn into any handsome Shape, especially if it have a warm Shelter, for sometimes a hard Winter kills it. It loses its Verdure in the Winter ; but placed as above in Shelter, it quickly recovers it in the Spring.

The PLATANUS, or PLANE-TREE.

THIS Tree, tho' of late Years it hath been much neglected and little sought for, is yet a most beautiful Shade, and grows very well with us in *England*, having no other fault but that it loses its Leaves early in the *Autumn*. The way of raising it is by its Seeds and Layers. This Tree was had in great Esteem and Veneration among the *Romans*. This Tree was first introduced among us by Sir G. Crook of *Oxfordshire*.

The ELDER and MEDLAR, and L'AZZEROLE.

THE *Elder* loves to grow in Hedge-Rows, or even under the shelter and dripping of other Trees in Woods, and is easily raised by Cuttings and Slips, or from the Seed, which is ripe in *September*. And from its Black Berries is made a very sovereign wholesome Wine. There is a sort also that bears White Berries, which some think is preferable for the purpose aforesaid. The early Buds of this Tree in the Spring boiled as *Watergruel*, is reckoned an excellent *Antiscorbutick* ; and it is besides a sovereign Plant in many Distempers. The young Wood of this Tree is useful to make Scoops for Apples ; and the bigger Branches are much used by the Butchers for Scures, when they cannot get Dog-wood.

The *Medlar*, tho' I have before spoke of it, yet I here rank amongst the Trees of the Wood ; because the common Stock whereon it is grafted is the *White-Thorn*, and it will endure any Exposition. But I know not that its Wood is any way peculiarly serviceable ; and its Fruit every one knows is not good till 'tis rotten.

The *L'Azzerole* is, as I have also observed before, a sort of *Medlar* brought originally from *Italy* and *Spain* ; there are several sorts of them, and they grow and bear Fruit with us very well, even amongst other Woods of the Forest. The Fruit of them all has an agreeable Acidity, and therefore the French make their best Sweetmeats of them.

The Lotus, the CORNEL-TREE, and the LARCH or LARIX.

Lotus.] **T**HE *Lotus* or *Nettle-Tree*, so called, for that the Leaves resemble those of the Nettle, is planted chiefly for variety, having nothing remarkable, but that it affords a very fine *Shade*, and pretty durable *Timber*; planted in moist Ground. The *Roots* of it make good *Hafts* for Knives and Carpenters Tools, and the Wood of it is not less useful for Pipes and other Instruments.

Cornel.] The *Cornel-Tree*, bears the Fruit call'd the *Cornelian-Cherry*, from the Resemblance it bears to the *Cornelian-Stone*, in the Colour of it. It is an old fashioned *Tree*; and the Fruit, tho' now out of Date, was formerly much esteemed both in the *Kitchen* and *Conservatory*. It is raised both of *Seeds* and *Suckers*, and grows to a good height in almost any sort of ground. The Wood being durable is useful for *Wheel-work*, *Pins* and *Wedges*.

Larch.] The *Larch* or *Larix* is another *Tree* not much known, and yet will arrive to a considerable bigness, producing *Timber* that is durable and useful. Mr. *Evelyn* takes notice of a great many Buildings in *Italy* made of this Wood, which he saith no *Worm* will touch, or scarcely any *Fire* burn. But *Quære*. However, from this *Tree* that useful Drug *Agaric* is gathered.

BUCKS-HORN-TREE.

THIS is called the *Virginian Summach*; the young Branches being of a reddish brown, feeling like the Velvet of a Buck's Horn, and yielding Milk like the Branch of a Fig, when broken or cut. The Leaves are indented, and at the end of the Branches come forth long, thick and brown Tufts, made of soft woolly Thrums; among which appear many small Flowers. It will grow in some Places near six Foot high: Is increased by *Suckers*, which it puts forth very plentifully. The Seed is flat and red, growing in Bunches or Clusters like Grapes.

The ACACIA, and BUCK-THORN.

THE *Acacia* is called so from the Resemblance its Leaves has to the true *Acacia*, something like the *English Vetch*. There are several sorts of them in *Holland*: But we have few in *England* but what are of the *Virginian* Kind, which will grow to a large *Tree*, and stand abroad without shelter in the Winter. Some are now growing in *Palace-Yard, Westminster*. They smell very fragrant, and afford a very pleasant *Shade*, which makes them very acceptable to Walks and Arbours. They love a dry Soil, and are propagated from *Suckers*. Their only Fault is, that the Wood is brittle, so that high Winds sometimes a little irregularly prune them.

The *Buck-Thorn*, is a *Tree* that grows frequently in the Hedges; for it is raised and planted as the *White-Thorn*, and makes a *Tree* of like Stature. It is deservedly valued for its *Black-Berries* in *Autumn*; the Juice whereof made into a Syrup with Sugar, is thought to afford one of the best and safest Purges.

C H A P. II.

Of the several Sorts of Ever-Green Trees, great and small, such as will bear our Climate without Housing. First,

Of the ILEX.

THE *Ilex*, or Ever-green Oak, is a Tree that deservedly stands in Front of all the *Ever-Greens*, both for its Beauty and Usefulness. But because there have been already so many Mistakes made, and so many Disappointments undergone with respect to the Kind and Management of this Tree, I have the Pleasure to let the World know from whence those Mistakes came, and how to prevent future Disappointments. The Secret I had from a Friend, who was well informed thereof by a Correspondent in *Italy*, who assures us, that there are *two Sorts* of *Ilex*, viz. the *Tree*, and the *Dwarf-Ilex*; both of them well known in *Italy*, by that distinction. And although they are exactly alike in Shape and Colour, when they are young, yet it is well known that the *Tree-Ilex*, will not easily be made a Dwarf, and the *Dwarf-Ilex*, can never be made a Tree, but is always intended and kept for *Espaliers*. It is the last of these whose Seed we commonly receive from *Italy* and *Spain*; and there have been very few of the former sort ever yet sent over, as imagining that we want *Espaliers*, and not *Timber*. Mr. *Balle* in *Devonshire*, and some few others, have been so fortunate as to light upon the large sort, and manage even that according to the Rules of Art, by either letting them stand in the Seed-Plot, without a remove, or if they are remov'd, to do it with the utmost Care and Caution, not hurting or shortning the *Tap-root*: But as far as I can find, it is the general Complaint, that the *Ilex* here proves a *Dwarf-Tree*: And for what reason, let it be judg'd by what hath been said above.

However, after such a Caution as this, it is easy to direct that the Seed be pluck'd from the large Trees, and not from Dwarfs, when a demand is made, or to get them from some of those large Trees now in *Devonshire*, raised from the Acorns, set in well sifted *Loam*; and not removed if possible, but with all the Root and Earth about them. This managed and rightly chosen, it is a Tree of very quick growth, vastly *beautiful* and very *profitable*. There is a great deal of the *Timber* brought over every Year into *England*, the Ship-Carpenters thinking it rather better and tougher than the *English Oak*. It delights in a deep Soil, rather moist than too dry, and is raised only from the Acorns, though I am apt to think it may well enough be grafted on a young vigorous *English Oak*. The Wood of this Tree is sometimes finely chamletted, as if it were painted. It is useful for *Chairs*, *Axle-Trees*, &c. being very hard and durable. And the Acorns are thought a Food for Hogs little inferior to *Chestnuts*.

The HOLLY-TREE.

THE *Holly* is a Bacciferous, Ever-green Tree, considerable for its *Red-Berries*, and large, shining, prickly Leaves.

This Tree is preferr'd before all other *English Winter-Greens*, and Mr. *Evelyn* wonders at those who are so expensive in Foreign Greens, and yet neglect the Culture of this incomparable Tree, which ought to be propagated not only for *Ornament*, but *Defence*, and divers other uses. We have two eminent Kinds of this Tree, the prickly, and smother leav'd, or as some call it, the Maiden Holly, not unwelcome when tender, to Sheep and other Cattle: There is also the yellowed Berried, and the variegated Holly; which proceeds from no difference in the Species, but *accidentally*, and by sport of Nature, or rather through Infirmary and Weakness, as most such Variegations do. And we are taught how to affect it *artificially*, by sowing the Seeds, and planting them in gravelly Soil, mixed with store of *Chalk*, and pressing it hard down; it being certain, that most or all of them return to their *Native Colour*, when sown in richer Mould.

The *Holly* is rais'd of the *Berries* (of which there is a sort that bears them *Yellow*) when they are ready to drop; they must be freed from their tenacious and glutinous *Mucilage*, by being wash'd, and a little bruised, then dried with a Cloth; or you may bury them as you do the *Yew* and *Hips*: Remove them after three or four Years; and if you plant the *Setts*, place them *Northwards*, as you do *Quick*.

Of this may Inclosures be made for Parks, &c. and cut into square Hedges, the Fence becomes impenetrable; and 'twill thrive in the *hottest* as well as the *coldest* Places. You may take (though this way I should not chuse, but rather from *Nurseries*) Thousands of the *Setts*, of four Inches long, out of the Woods, and so plant them; but this must be before the Cattle begin to crop them, especially Sheep, which are greedy of them when tender: Put them into the ground in a moist Season, Spring or *early* Autumn, but particularly the Spring; let them be shaded (if the Weather prove too hot and scorching) till they begin to shoot of themselves; and in very sharp Weather, and during our *Eastern* Winds, covered with dry Straw or Haume; and if any of them seem to be in a perishing Condition, cut such of them close, and you will soon see them revive at Root. The lustier and bigger the *Setts* are, the better; and if you can procure such as are a Thumb's-breadth thick they will soon furnish a Hedge.

Mr. *Evelyn* tells us of an Hedge of this Tree, of near three hundred Foot in length, nine Foot high, and five in Diameter: He calls it an impregnable Hedge, glittering with its arm'd and vernish'd Leaves; the taller Standards at orderly distances, blushing with their natural Coral: It mocks at the rudest Assaults of the Weather, Beasts, or Hedge-Breakers; and none unpunish'd can hurt it. This rare Hedge (the boast of the *Villa*) was planted upon a burning Gravel, exposed to the Meridian Sun: Where undoubtedly they thrive best, after they have been well guarded and watered for the two first Years.

In *Hertfordshire*, and almost all over the Bishoprick of *Durham*, and in many other Counties, these Trees grow naturally, even among the White-Thorn, and Ashes: But if your ground, in any Situation, be stiff, you are to loosen it with a little fine Gravel. Time must bring this Tree to perfection, as it does all things else, and we should work for Posterity: But a little Culture about the Roots, (not Dunging, which it abhors) and frequent stirring of the Mould, will very much add to its growth. Yet there is an Expedient to effect it more insensibly, by planting it with *Quick*: Let every fifth or sixth be an *Holly* Sett, which will grow up infallibly with your *Quick*, and as they begin to spread, make way for them by extirpating the *White-Thorn* till they quite domineer: There is also another, not less applauded Method of raising these Hedges, *viz.* by laying *horizontally* well rooted Setts, (a Yard or more in length) and stripping off their Leaves and Branches; these covered over with Earth, as the Poles of Hazel, &c. will send forth innumerable Suckers, which will advance into an Hedge.

The Timber of the *Holly*, (besides that it is the *whitest* of all hard Woods, and therefore used by the Inlayer) is for all sturdy Uses; the Millwright, Turner, and Engraver prefer it to any other: It makes the best *Handles* and *Stocks* for Tools, *Flails*, *Riding-Rods*, *Carters-Whips*; *Bowls*, &c. and of this have been made even *Hinges*, and *Hooks*, to serve instead of *Iron*. Of the Bark of this Tree is made our *Birdlime*: And the Leaves of it, dried to a fine Powder, and drank in White-Wine, is prevalent against the *Sore*, and cures *Fluxes*; they are also good against the *Cholick*; the Berries being swallow'd whole, purge *Pblegm*, without danger.

The YEW or EUGH.

THE *Yew-Tree* is a Bacciferous, Ever-green Tree, bears Red Berries, and hath small narrow Leaves of a dark Green.

For the sorts of these Trees, I must be beholden to Mr. *Evelyn*, for I have yet seen nothing of what he tells us of the *Arcadian* Black and Red, and the Yellow of *Ida*, infinitely esteem'd of old. Since the disuse of Bows the propagation of Yew is forborn; though to our Shame, seeing the barrenest Grounds and coldest of our Mountains might be profitably replenish'd with them; for besides the use of the Wood for Bows, 'tis excellent for *Cogs* of Mills, *Posts* to be set in moist Ground, and everlasting *Axle-Trees*: Also the Bodies of *Lutes*, *Theorbo's*, *Bowls*, *Wheels*, &c. are made of this Wood.

The *English* Yew-Tree is easily produced of the Seeds wash'd and cleans'd from their *Mucilage*, then buried and dried in Sand a little moist any time in *December*, and so kept in some Vessel of the House all Winter, and in some cool shady Place abroad all the Summer; sow them the Spring after: Some bury them in the Ground like *Harws*; it will commonly

commonly be the second Winter e'er they peep, and then they rise with their Caps on their Heads; being three Years old, you may transplant them, and form them into *Standards* for Walks, Hedges, &c. in all which they succeed well, and are worth our Patience, for their perennial Verdure and Durableness: For Hedges they are preferr'd for their Beauty, and being of all other Plants the most *tonfide*, are a stiff defence before any other against Wind and Weather.

The Yew is almost natural to the open Downs of *Hampshire* and *Wiltshire*, where they grow straggling in single Bushes, and to a great Bulk.

A great many of these Trees grow in *Surrey*; where Dr. *Moreton* bought an Estate, call'd *Yew-Wood*; although I presume good Husbandry has greatly alter'd the Place, and made Corn grow in the room of such Trees: And near *Boxhill*, as Mr. *Evelyn* says, if in any Spot of *England*,

————— 'tis here
Eternal Spring and Summer all the Year.

This Plant has a matted Root, and therefore delights in a dry and light Soil, and will grow sometimes even upon the barrenest Rocks. In my own Glebe there is now growing a *Yew-Tree* from the Clefts of the Rocks above thirty Foot perpendicular from the River side, and by the bigness and gradual decay of its Body, it seems to be at least two hundred Years old. This Tree is best transplanted either early in *Autumn*; or late in the *Spring*, viz. either in *August* or in *April*. It will grow of Slips apt enough for Hedges, but they will never grow tall or handsomely *Pyramidical*, which is of all others the best Shape.

The PHILIREA and ALATERNUS.

THESE two Plants (by those who are unskilful and have not nicely observed the difference) have often been accounted the *same*. But there is in many respects a great, real, and manifest difference. The Leaves of the first are larger and differently set on upon the Branch, as it were by Steps; whereas the other hath its Leaves in an alternate Order to one another, from whence probably its name *Alaternus*. Besides, the Seeds of the *Phylirea* (from whence it is raised) lie a Year in the Ground before they come up, but the other germinate the same Spring.

There are several sorts of the *Phylirea*: The most beautiful, though the most tender sort, is the *Dutch Kind*, edged with white, which if it is set either in Pots to be housed in the extremest Frosts, or against a *South Wall*, makes a most beautiful Shew all the Year. The *bloach'd Kind* mixt with *Green* and *Yellow* is an handsome Plant, and not near so tender as the other; but will endure, with the common sort, to be made *Pyramids* or *Balls*, or to be planted to cover *North Walls*, for it answers to the Sheers very well.

The *Phylirea* is to be governed as the Holly in raising it from Seed; but from *Layers* and even *Slips* it may be raised, and the gilded Kinds may be put into the common sort by *Inoculation*. It delights in a light unmixt Soil, inclining to Loam; for *there* it will thrive apace, and make excellent Hedges, Palisadoes, and Arbours.

The *Alaternus* requires much the same Management and Soil as the *Phylirea*. It is a quick Grower, and will form a fine Hedge, planted in single Rows two Foot asunder, even to twenty Foot high, if it have but some additional Support against the Fury of the Winds. Or it may be used for Ornament in *Pyramids* or *Balls* in *Compartments*.

The Box.

THERE are reckoned to be three or four sorts of Box. One sort runs up to Wood, and will make Timber and a considerable Tree, called therefore *Boxus Arborescens*. The second is called the *Shrub-Box*, and this is sometimes variegated and strip'd with *Yellow*. And the third is the *Dwarf-Box*, so well known for its singular use and beauty for Edgings; of all others the most durable and easiest kept in order.

The *Box-Tree* deserves to be cultivated for the excellency and usefulness of its Wood, and also because it will prosper on the Declivity of *cold, dry, barren, and chalky Hills*, where nothing else will grow. Mr. *Leiger* rightly judges the *large Box* to be of no use in

in Gardens; although Mr. *Bradley* thinks it makes *delightful* Hedges. However, the Taste of the present Age hath well nigh banished it from the Garden; and that with a good deal of Reason, on the account of its strong and disagreeable smell; especially after *clipping*. But as every thing hath, or should have its proper Place, so this Tree should find Encouragement at an humble distance from the House, for the Value and great Price set upon its Wood; which is thought to be the *hardest* and *heaviest* of all *English* growth, and therefore is eagerly sought for by the *Turner* and *Engraver*; by the *latter* especially, for all sorts of Mathematical Instruments. This Tree will thrive in almost all Soils, and (as I have already observed) in some of the *worst*. It is something tedious to raise it from the Seed: But it will grow with great facility from *Slips* or *Layers* in the Nursery. And every little Branch of the *Dwarf* sort will easily answer this way.

The CORK-TREE.

THE *Cork-Tree* with us, is of two sorts. The one hath a narrower and less jagged Leaf than the other, keeping its Leaves green all the Winter; but the Leaves of the other are broader and fall in the Winter. The *latter* sort is somewhat the hardiest; but they will both well enough endure our Climate and Winters. There are several of them of late Years planted in several parts of *England*; at my Lord *Pembroke's* in *Wilton* Garden, there is one of a considerable bigness, whose Bark plainly discovers the Nature of the *Cork*. It hath *three* Barks when it is full grown, the outermost whereof is the *Cork*, which, in the *West-Indies*, they strip once in two or three Years in a dry Season; because the Wet is apt to prejudice the Tree. And one of the other Coats being *Red*, bears a good price with the *Tanner*. I cannot learn that the Wood of the Tree is of any particular Service. It is to be raised from *Suckers* or *Layers*. Mr. *Evelyn* remarks, that the *Grecian* Ladies made use of the outward Cortex for Soles to their Shooes, and from thence were called *light-footed*.

JUNIPER-TREE.

THE *Juniper* is a *Bacciferous*, *Sempervirent* Shrub, whose Leaves are entire, of smooth edges, and distinguish'd by the Leaf, which is small, slender, prickly at the end, being odorate; and both the Leaves and Wood are of a pleasant Scent, producing *bluish* Berries, from whence the Tree may be raised.

Mr. *Evelyn* tells us of three sorts; the *Male*, the *Female*, and *Dwarf*; whereof one is much taller, and more fit for Improvement than the others: And there is yet a fourth, called the *Swedish Juniper*, of a much paler and handsomer green, and therefore more sought for than the *English*. The Wood is *Yellow*, and being cut in *March*, sweet as *Cedar*, whereof it is by some accounted a spurious Kind; all of them difficult to remove with success; nor will they prosper being much shaded, or over-dripp'd. He has rais'd them abundantly of their Seeds, (neither watering nor dunging the Soil) which in two Months will peep, and being govern'd like the *Cypress*, apt for all the Employments of that beautiful Tree: To make it grow tall, prune and cleanse it to the very Stem; the *Male* is best. The discreet loosening of the Earth, about the Roots, makes it suddenly spread into a Brush, fit for a thousand pretty uses, for it comes to be much unlike that which grows wild, and it may be formed into most beautiful and useful *Hedges* and *Arbours*.

Out of one Tree, *Arbours* may be made for several Persons to sit in: At *Woodcut* in *Surrey*, there was an *Arbour* made of a *Juniper-Tree*, which measured seven Foot square, and eleven in height; and would certainly have been of a much greater Altitude, and farther spreading, had it not been continually kept shorn: And what is the most considerable, it was then hardly ten Years since it was brought out of the Common a slender Bush, of about two Foot high. At *Ebisbam* in *Surrey*, are also exceeding fine *Juniper* Hedges.

Mr. *Evelyn* experimented a proportionable Improvement in his own Garden, where he mingled them with *Cypress*, and found they perfectly became their Stations, where they might enjoy the Sun: They may be properly set where *Cypress* does not so well thrive, *viz.* in such Gardens and Courts as are open to the Eddy-Winds, which indeed a little discolour our *Junipers* when they blow *Easterly* towards the Spring, but they constantly recover again; and beside, the Shrub is *consile*, and may be put into any shape.

The Berries of the *Juniper* afford (besides a tolerable Pepper) one of the most universal Remedies in the World; for being swallow'd *whole*, they seldom fail to appease the Wind-Cholick; in a Decoction they are most sovereign against inveterate Coughs; and the Water is an excellent *Specifick* against the Gravel: But all is comprehended in the Virtue of an Electuary made of it, which is good against the Stone, Rheums, Dropsy, Jaundice, inward Imposthumes, Palsey, Gout, and the Plague.

The Timber of this Wood is fit for many curious Works, for *Tables, Chests, Carvings, Spoons, &c.* and the very *Chips* render a wholesome Perfume *within* Doors, as well as the dusty Blossoms in Spring *without*.

The LAUREL; English, Alexandrian, and Cherry.

THE *Laurel* is an old fashioned and now much neglected Tree; for it is neither fit for Hedges nor Pyramids, the Sheers not at all agreeing with it, on the account of its large Leaves, which look very awkward and unnatural when they happen (as it must so happen) to be cut in halves. If it hath any Beauty or Excellence, it is when 'tis wholly neglected in Standards, or when planted against *North Walls*, where they may be only a little tack'd to, and so left to Nature, its shining verdant Green not looking amiss. It is to be raised from the Berries or from Suckers, which it puts forth very plentifully, and may be inoculated on the *Black-Cherry, Plum, or Apricot*; which is a certain Indication that both Leaves and Fruit partake nothing of the Nature of the Juices of the Stock, but are altogether formed from the Nature of the Cyon, and the Figure of its Vessels and Ducts. There is a sort of it prettily bloach'd with white in the middle of the Leaves, which adds much to its Beauty.

The *Alexandrian Laurel* makes Shoots about three Foot high, which are flexible, and adorned with oblong sharp-pointed Leaves, of a fine green Colour, but smaller than the common *Laurel*. From the middle of these Leaves arise others of much the same shape, which form a sort of *Tongue*, and from the top of these Branches grow the Flowers. The same Ground and Culture doth for this as for the common *Laurel*.

There is also a *Cherry-Laurel*, so called from the largeness of its Fruit, being as big as a *Cherry*. This is also propagated from the Root, and loves the Shade, or may be inoculated on the *Cherry*. It endures the hardest Winters, will do well for either Hedges or Standards, and so serves either for the Garden, or for Groves and Wilderesses. They are an *Ever-green*, brighter and softer to the touch than the common *Laurel*.

CYPRESS-TREES.

THE *Cypress* is also a Coniferous, Ever-green Tree, whose Cones are roundish, of the lesser sort, having short Leaves, which naturally grow in a *Conical Figure*.

It is therefore a beautiful Tree; and was within a few Years past reputed so tender and nice a Plant, that it was cultivated with the greatest care, and to be found only amongst the *Curious*; whereas we see it now in many Gardens, rising to as goodly a Bulk and Stature as most are in *Italy*; for such were in the Garden of King *Charles the First*, at *Theobald's*, before that princely Seat was demolish'd.

We had our first *Myrtels* out of *Greece*, and *Cypress* from *Crete*; and we have in *England* three sorts of *Cypress-Trees*, which are all of them easily propagated, and prosper very well, if they are rightly ordered. The Tradition is, that the *Cypress* is never to be cut, for fear of killing it; but there is not a more *tonsile* and governable Plant in Nature; for it may be cut to the very Roots, and yet spring afresh: The *Cypress* being raised from the Nursery of Seeds, sown in *September* (or rather *March*) and within two Years after transplanted, should at two Years standing more, have the *Master-Stem* of the middle Shaft cut off some hand-breadth below the Summit, the Sides and smaller Sprigs shorn into a *Conique* or *Pyramidal Form*, and so kept clip'd from *April* to *August*, as often as there is occasion; and by this Management they will grow furnish'd to the Foot, and become the most beautiful Trees in the World, without Binding or Stake, which makes them but rot and mould within; still remembering to abate the *middle Stem*, and to bring the *collateral Branches* in its stead to what Altitude you please; but by *shortning* the middle Shoot is not meant the *dwarfing* of it, and therefore it must be done *discreetly*, so as it may not over-hastily advance, till the Foot thereof be perfectly furnished.

Another

Another way of dressing this Tree, with all the former Advantages, is by sparing the *Shaft* altogether, and diligently cutting away all the *forked* Branches, reserving only such as *radiate* directly from the Body, which being shorn and clip'd in due Season, will render the Tree very beautiful; and though it be more subject to obey the shaking *Winds*, yet the natural *Spring* of it does immediately redress the Injury, without the least discomposure. Thus also may you form them into Hedges and Walks; or by sowing the Seeds in a shallow Furrow, and plucking up those that come too close and thick: For in this Work, it will suffice to leave them within a Foot of each other; and when they are risen about a Yard high (which may be to half your Pallisado) cut off their Tops, as you are taught, and keep the sides clip'd, that they ascend by degrees, and thicken at the bottom as they climb up. Thus they will present you, in six or eight Years, with incomparable Hedges, preferable to all others, because they are perpetually green, and able to resist the Winds better than any, the *Holly* excepted, which has no equal. By *Winds* are meant their fiercest *Gusts*, not their *Cold*; for our cruel *Eastern* Winds do sometimes mortally invade *them* which have been left clipp'd, but seldom the untouch'd, or those that were dress'd in the Spring only.

The Frost of the severest Winters, till it joins Forces with destructive Winds, never does any considerable damage to these Trees, unless they have been clip'd late in the *Autumn*; neither will they then affect them, if cloathed with a Wisp of Hay or Straw, to secure them from the Winds; and the Frosts only discolour them, but seldom or never hurt them. If they are not thus cloathed, or capp'd, when they are late cut to the Quick, (at the latter end of *October*) and are raw of their Wounds, they are subject to take cold, and *gangreen*, and at length *die*.

If you affect to see the *Cypress* in *Standard*, and grow wild (which in time may arrive to be of large Substance, plant of the reputed *Male* sort; it is a Tree which will prosper wonderfully; and it is of this Timber that the *Venetians* make their greatest Profit. There is likewise the *Tarentine Cypress*, so much celebrated by *Cato*; and both that and the *Milesian* are worthy of Culture.

Beside raising from the Seed, (as aforementioned) the Ancients, who were wont to make great Plantations of them for Timber, had another Method, which has here been practised: If you receive your Seed in the Nuts, which uses to be gathered thrice a Year (but seldom ripening within) expose them to the Sun till they gape, or near a gentle Fire, or put them in warm Water, by which means the Seeds will easily be shaken out; for if you have them opened before, they do not yield you half your Crop: About the beginning of *April*, or before, (if showry Weather) prepare an even Bed of fine Earth, and clap it down as Gardiners do with their Spades for Purselain Seed; upon this strew your Seeds pretty thick, then sift over them some more Mould, more than half an Inch thick; keep them duly watered after Sun-set, unless the Season do it for you; and after one Year's growth, you may transplant them as you please. In watering these, and most tender and delicate Seeds, 'tis better to dew them with a Broom or Sperritory, than hazard the beating them out with the common Watering-Pot; and when they are well come up, be but *sparing* of Water.

Be sure to cleanse your Trees, when the Weeds are very young, lest you eradicate your *Cypress*: And if well watered, they will make a prodigious Advance. They thrive best in our sandy, light, and warmest Grounds; but in low, and moorish Places, stiff and cold Earth, &c. they never prosper. When that long and incomparable Walk of *Cypress* at *Frascati* near *Rome*, was first planted, they drew a *small Stream* by the Foot of it, and made it arrive (as reported) to seven or eight Foot height in one Year.

The *Venetians* sufficiently understand the Uses of this Timber for *Chests*, *Hurps*, and other *Musical* Instruments; for it resists the *Worm* and *Moth*, and all Putrefaction, and is also very *sonorous*, and therefore employ'd for *Organ Pipes*. At *Venice* were to be seen Planks of above four Foot in breadth, of this Timber; and the *Valves* or Gates of Saint *Peter's* Church at *Rome* were made of this Material, which lasted from the Time of the *Great Constantine* to Pope *Eugenius* the Fourth's Time, almost six hundred Years, and were then as fresh and entire as if they had been new; but this Pope would needs change them for Grates of Brass. *Thucydides* tells us, that the *Athenians* used to bury their Heroes in *Cypress* Coffins, and many of the *Mummy* Chests brought from *Aegypt* with those condited Bodies are of this Wood, which probably may have lain in those dry and sandy *Crypta* many thousand Years.

The lasting Bridge built over the *Euphrates* by *Semiramis* was hereof: And it is reported pleasantly, that *Plato* chose this Wood to write his Laws in, before *Brass*, for its *Duration*. The People of *Crete* and *Malta* build with this Timber, because they have plenty

of it, and nothing outlasts it or can be more beautiful. Divers will have this to be the *Gophir* Wood, mentioned in the Scripture: It is commended for the Improvement of the Air, and *Specifick* for the Lungs, as sending forth most sweet and *Arromatick* Emissions, when clipp'd or handled; and the Chips and Cones being burnt, extinguish *Moths* and expel *Gnats* and *Flies*: The Chips also give flavour to Muscadines and other rich Wines. This Wood likewise yields a very good Gum, not much inferior to *Turpentine*.

Mr. *Mortimer* tells us of a Friend of his in *Barbadoes*, who cut down one of these Trees there, which had above four hundred Foot of Timber in it. And that there were others still of greater Magnitude.

F I R - T R E E S.

THE *Fir* or *Deal*, is a *Coniferous*, Ever-green Tree, whose Cones are of the lesser sort, having long Leaves; either that whose Leaves encompass and cover the Branches, bearing long Cones hanging downwards, as the *Male Fir-Tree* or *Pitch-Tree*; or that whose Leaves grow from each Side of the Stalk, being more flat like those of the *Yew*, *Green* on the upper Side, and *Whitish* underneath, *furcated* at the End, bearing Cones shorter and thicker, and growing erect as the *Female Fir-Tree*. The first of these is called the *Scotch*, the other the *Norway* or *Spruce Fir*, which answers much better to the Sheers than the other.

This Tree is easily rais'd of the Kernels, which may be gotten out of their Cones by exposing them a little before the Fire, or in warm Water till they begin to gape. The Seeds may be sown in Beds or Cases in *March*, and when they peep they are to be carefully preserv'd with Furzes or the like Fence from Birds: The Beds should be made in a shelter'd Place, and the Seed sown not above half an Inch deep in shallow Rills, and covered with fine rich Mould: When they are not up a Finger high, strengthen their Stalks by sitting some more Earth about them: When they are two or three Years old you may transplant them, and after three or four Years, when well rooted, they make prodigious Shoots.

Firs will grow in moist Clays or barren Gravel, and even in poor Ground if not over light and sandy: Before sowing the Seed, turn it up a Foot deep, sowing or setting your Seeds a hand distance, and riddle Earth on them: In five or six Weeks they will peep: When you transplant, water them well before, and cut the Clod out about the Root, which knead close to them: Thus they may be safely sent many Miles, but the Tops must neither be bruised nor cut, which would *dwarf* them, and make them ill shaped for ever after.

The best time to transplant these Trees is in the beginning of *April*; and they will thrive mainly if transplanted into a stiff hungry *Clay*, or rather *Loam*, and not a *rich* Soil: If your Ground be improper, fill the Holes with such barren Earth, and if the *Clay* be too stiff, with a little *Sand*, removing them with as much Earth about the Roots as is possible: If through necessity you plant towards the latter end of Summer, lay a pretty deal of Horse-Litter upon the Surface of the Ground to keep off the *Heat*, and in Winter the *Cold*; but let no Dung touch the Stem or Root. You may likewise sow in such Earth about *February*, they will shoot the first Year an Inch, the next an handful, the third three Foot, and thence forward above a Yard annually, except a very dry Year overtake, and that will discover a manifest Difference. The Facility of their Propagation, their affecting Places where little else will thrive, their *Uniformity* and *Beauty*, their perpetual *Verdure*, Sweetness, and Fruitfulness, affording *Seeds*, *Gum*, *Fuel* and *Timber*, of all other Wood the most useful and easy to work, &c. all these Qualities render them highly worthy of Recommendation as an excellent Improvement of Husbandry, fit to be enjoin'd by some Law or Statute, to the Inhabitants of this Island, that we might have Masts for Shipping, and those other Materials of our own Production, without being oblig'd to other Nations.

Fir is of extreme great use: It makes our best *Masts* for Shipping, *Sheathing*, *Scaffold Poles*, &c. (heretofore the whole Vessel); and tho' *Fir* rots quickly in *salt* Water, it does not so soon in *fresh*; nor is it refus'd in Merchant Ships, especially the upper Parts, because of its Lightness: It is also useful in Wainscot, Floors, Pales, Boxes and Bellies for all Musical Instruments. It is exceeding smooth to polish on, and therefore does well under Gilding; and takes Black equally with the *Pear-Tree*: *Fir* does well in Carvings, as for *Capitols*, *Festoons*, *Statues*, &c. especially being gilded, because of the easiness of the Grain to work: And it takes the *Tool* every way. That famous Image of the *Blessed Virgin* at *Loretto* (said to be carved by *St. Luke*) was made of *Fir*.

The Heart of *Deal* is almost everlasting if kept dry, and no Wood agrees with Glew like it. Whole Towns and Cities are built of this Wood, in the *Northern* Parts of the World, as *Moscow*, &c. and *Tholouse* in *France* was within not much more than an Hundred Years, most of *Fir*. Most of *Venice* and *Amsterdam* is built upon them: And they make excellent Piles to superstruct on in boggy Ground. In former times they made *Carts* and *Coaches* of this Wood.

The resinous Tops of *Fir* and *Pines* are a sovereign Remedy in *Scorbutick* Diseases, *Gravel* in the Kidneys, &c. and the Chips or Shavings of *Deal* Boards, besides kindling of Fires, are useful to keep Drink instead of *Hops*.

The *Fir*, and most *coniferous* Trees, yield the same Concretes, *Turpentine*, *Resins*, *Pitch* and *Tar*, &c. as the *Pitch-Tree* or *Pine*. But Mr. *Evelyn* dislikes transplanting of *Firs*, because for want of Tap-Roots (especially if set close or in Tufts) they are in danger of being destroy'd by Winds: Therefore they do best in Walks at competent Distances. The Rule is, *Woods should be sowed, and not remov'd*.

There is a *Silver Fir*, which Mr. *Evelyn* names *Spanish*, which is still a more beautiful Tree than either of the two former, by reason of its Silver Colour on the inside of the Leaves; but whether it is better than either of the former for use, is still uncertain.

The PINE-TREES, &c.

PITCH and *Tar* are mostly made in *New-England*, from the *Pine*, which naturally yieldeth *Turpentine*, at first flowing liquid and clear, but being hardened by the Air, is not much unlike the *Burgundy Pitch*; and in that Country they are call'd *Pitch Pines* out of which this gummy Substance transudes: They grow upon the most barren Plains, and on Rocks, and Hills arising amongst those Plains, where several are found blown down, that have lain so long, as that the whole Trees being perished, some certain Knots of the Boughs have remained entire, lying at the same Distance and Posture as they grew upon the Tree, for its whole Length: The Bodies of some of these Trees are not corrupted by Age, and when reduc'd to Ashes by Fire, it hath no Power over these hard Knots, beyond a black Scorching; tho' on Heaps they are apt to burn.

Of these Knots they make their *Tar* in *New-England* and the Country adjacent, while they are well impregnated with that *Terebinthine* and *Resinous* matter, which like a Balsam preserves them so long from Petrefaction. The rest of the Tree contains the like *Terebinthine* Sap, as appears from Incision, by a small Christalline Pearl, which sweats out; but this being more watery and undigested, renders the Tree more obnoxious, especially if it lies prostrate with the Bark on, which is a Receptacle for a certain Worm that hastens its Decay.

The Knots alone, the Tar-makers amass in Heaps, carrying them in Carts to some Place, where finding Clay or Loam fit for their turn, they lay an Hearth of such ordinary Stone as they have at hand: This they build so high from the Level of the Ground, that a Vessel may stand a little lower than the Hearth, to receive the Tar as it runs out. The Hearth is made wide according to the Quantity of Knots to be set at once, and with a smooth Floor of Clay, yet somewhat descending from the extreme Parts to the Middle, and thence towards one of the Sides, where a Gullet is left for the Tar to run out at.

When the Hearth is thus finish'd, they pile the Knots one upon another, as our *Colliers* do their Wood for Charcoal, and of a Height proportionable to the Breadth of the Hearth, and then cover them over with a Coat of *Loam* or *Clay*; which is best, and in defect of them, with the best and most tenacious Earth the Place will afford; leaving only a small Spiracle at the Top, whereat to put the Fire in, and making some little Holes round about at several Heights for the Admission of so much Air as is requisite to keep it burning, and to regulate the Fire by opening and stopping it at pleasure. The Process is the same almost with that of making *Charcoal*; for when it is well on fire, the Hole at top is stopped, and the Registers so govern'd, as the Knots may keep burning, and not be suffocated with too much Smoke; whilst all being now thorough heated, the Tar runs down to the Hearth, together with some of the more watery Sap, which halting from all Parts towards the Middle, is convey'd by the aforementioned Gutter into the Vessel placed to receive it.

The *Tar* being all melted and run out, they stop all the Vents very close, and find the Knots made into excellent *Charcoal*, prefer'd by the Smiths before any other made of Wood; and in defect of *Sea-Coal* they chuse this, and give greater Prices for it. From these Knots also the Planters split small *Slivers*, about the thickness of one's Finger, which

burn instead of Candles, giving a very good Light: This they call *Candle-wood*, and is much in use in *New-England*, &c. The Knots are not to be separated, only by time; neither are they the only Materials from whence *Tar* can be extracted; for there are many other Trees abounding with the same sort of Knots, and full of *Turpentine* to make *Tar*: But the felling and cutting out the Knots, would exceed the value of the *Tar*; whereas the Knots above described are gotten only by gathering. Sometimes Trees are found, the lowest part of whose Stems towards the Root, is as full of *Turpentine* as the Knots; of these also may *Tar* be made, but such being rare, are commonly preserv'd to split into *Candle-wood*, because they easily rive into any Lengths and Scantlings, much better than Knots.

The whole Art of *Tar-making*, is but a kind of rude Distillation *per descensum*; and might be as well done in Furnaces of large Capacity, were it worth while. Of *Tar*, by boiling it to a sufficient height, is *Pitch* made; and in some places where *Rosin* is plentiful, a fit proportion of that may be dissolv'd in the *Tar*, while it is boiling, and this is soonest converted to *Pitch*, but 'tis something different from what is made of *Tar* only. Some Persons, to bring their *Tar* into *Pitch* for a sudden use, make the *Tar* so hot in an Iron Kettle, that 'twill easily take Fire, and when blazing, set it in an airy Place to burn, till it appears of a sufficient Consistence, then by covering the Kettle close the Fire is extinguish'd, and the *Pitch* is made without any more Ceremony.

Five Leagues from *Marseilles* are very high Mountains, for the most part covered with Forests of *Pine-Trees*, which grow wild; and here you see the making of *Pitch*, *Tar*, *Rosin* and *Turpentine* thus. In the Spring when the Sap runs most, they pare off the Bark of the *Pine*, to make the Sap run down to the Hole, which they cut at the bottom to receive it; as it runs it leaves a *Cream* or *Crust* behind it, which they take and temper in Water, and vend for *White Bees-Wax* (tho' it is not so) that they make *Flambeaux* of; then they take up the Juice in Spoons from the bottom, and when they have a good quantity, they strain it through such a Basket as Grocers put *Malaga Raisins* in; what runs through easily is the common *Turpentine*, what remains they distil in an Alembick with a sufficient quantity of Water, and what comes over is *Oil of Turpentine*, and the *Calx* remaining is common *Rosin*: Then they cut the Stock of the Tree into large *Chips*, and pile them hollow in a Cave, covering it on the Top with Tiles, but so as to let some Air come in to feed the Fire, and then burning them, there runs a thick Juice to the bottom, where they make a small hole for it to run out at, and that which so runs is *Tar*: Then boiling it gently to consume more of the Moisture, they set it to cool, which when cold is *Pitch*.

The great use of *Pitch* and *Tar*, in our Shipping and Navigation, is sufficient to make this short Account of their making it acceptable; especially as the *Fir* (a Tree of our own natural Product) furnishes us with like Materials for *Pitch*, *Tar*, *Turpentine*, &c.

Turpentine is us'd in many Medicines; as is likewise *Pitch* for Ointments, &c. and from the burning and fuliginous Vapours of these, especially the *Rosin*, we have our *Lamp* and *Printers Black*.

'Tis thought that the *Pine* and *Fir-Trees* in *Scotland* might yield his Majesty plenty of excellent *Tar*.

The Cultivation of all the several sorts of the *Pines* is much after the manner of the *Fir*, to which Head I refer the Reader; but it should be taken notice of here, that there are many sorts of *Pines*, and the Tree hath the different Sexes of *Male* and *Female*; for the *Male* is generally lower, and more knotty than the *Female*: That sort called the *Picca* affects cold Ground and prospers well in *England*, and so doth the *Pineaster* or wild sort, out of which is extracted great store of *Pitch*. And we are told of another Sort called the *Peda*, which grows in *Dalmatia*, and is so unctuous that it will slit into *Candles*.

ARBOR VITÆ.

THE *Arbor* or *Lignum Vitæ* is a curious *Ever-green*; and if it likes the Soil, which should be *Loamy*, will grow to a great height and make handsome *Timber*. It also makes beautiful Standards for *Pyramids* and *Balls* to adorn the *Parterres*; for it bears the Sheers very well, and is therefore also good for *Hedges* and *Arbours*. The smell of the Leaves is *Aromatic*; offensive to some, and pleasing to others. It is thought when rubb'd between the Fingers, to smell like *Cheshire Cheese*. Whether it be from this strong smell or any other Virtue in the Leaves, I know not; but 'tis an excellent *Specific* for an *Ague* when rubb'd or bruised with a *rolling Pin*, and afterwards apply'd to the *Wrists* and *Soles* of the Feet, where it should continue several Days ty'd on. I have seldom known it fail of a Cure, especially among Children, except in very stubborn and extraordinary Cases.

It is hardy, and very natural to our Climate, which makes me wonder it is not more cultivated; especially considering it is easily raised either from *Layers* or *Slips*, and is of all others incomparably the *best* for the Turners use; the Wood being smooth and compact, and prettily *veined*; which makes the *Boxes*, *Bowls*, *Cups*, and other *Curiosities* made of this Wood much sought after and desired.

The *Leaf* of this Tree is likewise thought to make one of the best Ointments for green Wounds, for healing them suddenly.

IVY, Strip'd and Plain.

THE *plain Ivy*, is an old fashioned Green, of late Years much neglected and despised; chiefly because being a Climber and not able to support itself, it hath been found to injure the Buildings against which it is set; forasmuch as it eats out the Mortar from between the Joints of the Stone, with its natural Claws, which find and search every Passage. Neither its Blossoms nor black Berries are very beautiful; but its Leaves are of a fine shining Green all the Year; which chiefly gave it its former Reputation. But there is a *strip'd sort*, edged with Silver, which looks very beautiful; and very agreeably covers a *North Wall* made with Brick, where it can do but little harm with its Claws. Besides, tho' it hath been thought to be such a Climber as would not grow without a support, yet Experience and Practice teaches, that it may be made a Dwarf Standard with its strip'd Head cut into round Balls, than which nothing more pleases the Eye, nothing better endures the Cold, and nothing is of late more sought for among the hardy Ever-greens. It may be propagated either from *Suckers* or *Layers*.

SAVINE.

SAVINE or *Sabin* is a dwarfish Ever-green, not much unlike to the *English Juniper*. It bears clipping, and is therefore fit either for Hedges or Standards cut into Form. A Decoction of the Branches of this Tree is an excessive Bitter, and effectually cures the Worms: It is usually raised from *Layers* and *Cuttings*.

PYRACANTHA.

THIS is a *Thorny Shrub*, shooting out several Branches which bear Leaves like those of a *Wild Pear*, of a dark green colour all the Year. This Plant hath many Excellencies, which other Greens of the *Parterre* want; and yet (for what Reason I know not) it doth not meet with that Encouragement it deserves. For besides the Beauty of its green Leaves, and the Bunches of Flowers it puts forth in *May*, it bears Clusters of *Berries* of such a bright Scarlet, as dazzle the Eye; which commonly hang on the Tree all the Winter till *Spring*; if the Birds will let them alone, for they are greedy of them in hard Weather.

The strong, frequent, and prickly *Thorns* it puts forth, occasions the Tradition, that this was the Tree, of which our Saviour's *Crown of Thorns* was made, from hence by some this is called the *Holy Thorn*; growing, as it is said, frequently in *Judea*. It may be trained into Balls and Pyramids, but then a great deal of its Beauty is lost when it grows *stubbed* and *woody*; and besides, the *Flowers* and *Berries* always grow on the Wood of the last Year,

Year, which in close clipping, is chiefly removed; and therefore the best way of managing this Tree in Perfection and Beauty, is to plant it against the *North* Sides of the House or other Buildings, where it may have room to spread: For chiefly on the *horizontal* Branches will it display its Beauty in *Flowers* and *Scarlet Berries*.

As to the *Culture* of this beautiful Plant, it is raised either from the *Berries*, or from *Layers* and *Suckers*. In the first way the Seeds must be ordered as those of the *Holly*; but I think the giving them first to Fowls to pass through their Bodies, is a little too *fanciful*: It may suffice only to lay them in heaps in some by-place for one Year, and sow them the next. In the other way from *Layers* and *Suckers*, care should be taken that they be not too long out of the Ground, having commonly but few and weak Fibres. It delights in a mixt loamy Soil, hating either *Clay* or *Sand*, much more any Dung or Manure.

CELASTRUS and ARBUTUS.

THE *Celastrus* or *Staff-Tree* is but little regarded and taken notice of, yet it is but just to let it have its place in a compleat Collection; it bears green Leaves all the Winter, and some mix it with the *Pyracantha* to make the Ever-green Hedges. It is raised of Seed and Layers, and removed in the Spring.

The *Arbutus* or *Strawberry-Tree*, fills a place amongst the Ever-greens very agreeably. It is indeed an *Exotic*, and hath been used very tenderly (as many others have, that need it not) but it is by Experience found to thrive very well amongst our *English* Greens, tho' more *commonly*, and some think more *naturally*, in *Ireland*. There are some very large Trees of it in the Gardens about *London*, which bear *Flowers*, *Fruit* and *Seed*, to perfection. It holds its Leaves on all the Winter, which are of a bright shining *Green*, much resembling the Bay, only more *indented*, and the young Shoots are a little *reddish*. In short, it is one of the most beautiful Plants, not variegated, we have. It is something difficult both to *raise* and to *remove*. The best way is from the Seed, which is contained in the Fruit like a *Strawberry*, and of no unpleasant Taste when it is ripe about *Christmas*. The Seed should be sown in a Box of light Earth in the Spring, and carefully covered, to the thickness of a Crown-piece, with sifted Mould. The gentle Heat of a *Hot Bed* will accelerate its Germination, and increase its Stature; but I am still of the mind, that for Health and long Life, *Nature's* and the *Carrier's* Pace is best: If you can find a way to lay some of its tender Branches, let it be done in fine Earth about *September*, and in a Year's time, (if it be a dripping Summer, or that it have frequent waterings) it will have got Strength enough to be transplanted in the following Spring, but yet with great care and caution. It cares not much for the *Sheers*, and indeed doth not much want them, being disposed to grow into good Shape. Where there is plenty, some will make Hedges of them, but they appear in their greatest Beauty in the *Wilderness-Works*. It avoids *Clay*, and delights chiefly in a rich *Gravel* or *Sand*; where it will most commonly blossom twice a Year.

CEDAR-TREES.

CEDAR is a Coniferous, Ever-green Tree, large and tall, and bearing great roundish Cones of smooth Scales, standing upwards, the Leaves being *small*, *narrow*, and *thick set* together.

There are several sorts of this Tree not much differing from one another; but the sorts known and growing in *England*, are three; *Virginia*, *Bermudas*, and the *Lebanon* Cedars.

This Tree Mr. *Evelyn* says, grows in all Extreams; in the moist *Barbadoes*, the hot *Bermudas*, the cold *New England*, even where the Snow lies almost half the Year; and why then it should not thrive in *Old England*, he conceives to be the want of Industry: It grows in the Bogs of *America*, and on the Mountains of *Asia*. He has frequently rais'd it of the Seeds, which he set like the Bay-Berries; and we might have of the very best kind in the World from the *Summer Islands*, tho' now almost exhausted there also; so that the most incomparable of that Sacred Wood, is like to be quite destroy'd, which is by Nature almost Eternal: What we have from *Barbadoes* and *Jamaica* is a spurious sort, and of so porous a Nature, as that Wine will soak through it; but that they call so in *New England*, is a lofty Grower, which being sawn into Planks make excellent Flooring, and everlasting: They shingle their Houses with it, and use it in all their Edifices.

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It is the *Oxycedrus* of *Lycia*, which the Architect *Virtruvius* describes to have its Leaves resembling Cypress; the right *Phenician* Cedar has them like the Juniper, and it bears a Cone not so pointed and distinct in Scales, as those from Mount *Lebanon*.

'Tis recorded that in the Temple of *Apollo* at *Utica*, there was Timber of near two thousand Years old, of this Wood: In *Sagunti* in *Spain* there was a Beam in a certain Orationary consecrated to *Diana*, which had been brought from *Zant* two hundred Years before the Destruction of *Troy*: The Statue of that Goddess in the famous *Ephesine* Temple, was of this Wood, as was most of the Timber-Work in all their Sacred Buildings.

The *Sittim*, mentioned in Holy Writ, is believ'd to have been a kind of Cedar; of which precious Utensils were form'd. *Sesostris* King of *Egypt* built a Ship with Cedar of 280 Cubits; and *Noah's* Ark is suppos'd to be built of Cedar: The Mast of *Demetrius's* *Galeasse* was one Cedar; and one of the Float that wafted *Caligula's* Obelisk out of *Egypt* was four Fathoms in Circumference. 'Tis writ also of a Cedar growing in the Island of *Cyprus*, which was 130 Foot long, and 18 in Diameter.

The Cedar is excellent for Posts and Columns, because of its direct growth, natural and comely Diminutions; and the more odoriferous the Trees are, the more durable and lasting. Mr. *Evelyn* wishes that Cedar might be brought into more common use, since besides the everlastingness of the Wood, not obnoxious to Worms, and which would also be a means to preserve Cloth and other Goods from Moths and Corruption; it would likewise be a Cure to reform the Malignity and Corrosiveness of the Air, and make this City as if it stood among the Spices of *Arabia*, or the Prospects of Mount *Lebanon*.

Mr. *Mortimer* seems to have been very exact in, and to have understood well, the raising and cultivation of this delightful Tree, so much neglected, because little understood. He tells us of that sort which is esteemed the tenderest, viz. the *Lebanon Cedar*, that it bears even the severest Winters we have. He himself raised several of them of Cones, which he had from Mount *Lebanon*, and hath had a Walk long since planted with them. For, (as he rightly observes,) the Seeds keep well in the Cones, which may be brought from the furthest parts of the World with safety; and if the Seed is not taken out of the Cone till the Time of sowing it in the Spring, it may last good three or four Years. Some Years since there was a fine Tree of this sort growing at *Stanstead* in *Essex*, and I suppose it is there still; for it had outlived some of the severest Winters when I saw it: It cannot be less than 50 Years old, and therefore every Year better able to resist cold, and to naturalize itself.

The *Juniper* is reckoned to be a sort of Cedar.

ROSEMARY of several Sorts.

ROSEMARY is a fine Aromatic Ever-green Shrub, useful both in its Leaves and Flowers for many purposes. There are several Sorts of it, viz. the *Common narrow leaf'd*; the *broad leaf'd*, the *gilded* or variously *strip'd* with *Yellow*, and the *Silver Rosemary*. And Mr. *Mortimer* tells us of another sort that bears double *bluish* Flowers. Those that are *strip'd* are most tender: But any of them set in a dry Soil, and under a tolerable Shelter, will last many Years, and defy the Frosts, which yet will kill them if they are planted in a cold wet Soil. They are increased very easily, either of Seeds, or Slips, set in *April* or *May*, which quickly take Root, if they are Shoots of the last Year. If this Plant is set against a South Wall, it may be trained up to a considerable Height, and if it is planted in a sheltered place in the Parterre, it will form itself, with a little help of the Sheers, into handsome Pyramids. The Roast Beef formerly seldom appeared with any grace, except stuck with Rosemary: But Time and Fashion alter both Palate and Beauty.

BAY-TREE.

THE *Bay* is a Bacciferous, Ever-green Tree, considerable for its *Berries*; whose Leaves are short, odorate, of a deep Green, and each Berry containing two *Seeds*.

Mr. *Evelyn* tells us they are increased both of their *Suckers*, and *Berries*; which should be dropping Ripe before gathered: *Pliny's* process was the gathering the *Berries* in *January*, spreading them till their sweat be over, then putting them in Dung, and sowing them: To steep them in Water, is as well as Wine; some wash the *Seeds* from their *Mucilage*, by breaking and bruising the glutinous *Berries*: Then sow them in *March*, by scores in a heap, and so they will come up in *Clusters*; but not so fit for Transplantation as where they are interred as you would *furrow* Pease: This way, and setting them apart, will raise Multitudes, and that in the *Berries*, without any farther Preparation; only for the first two Years they should be defended from the piercing Winds, which frequently destroy them; and yet the scorching of their tender Leaves, ought not to make you despair, for many of them will recover beyond expectation.

This *Aromatic* Tree greatly loves the Shade, yet thrives best in our hottest Gravel, having once passed the first difficulties; Culture about the Roots, wonderfully augments its growth; so as Trees of them will grow near thirty Foot high, and two Foot diameter. They are fit also both for *Arbour* and *Palisade-work*, provided the Gardener understands when to prune them and keep them from growing too *Woody*.

The *Berries* are emollient, Sovereign in Afflictions of the *Nerves*, *Cholicks*, *Gargarisms*, *Baths*, *Salves*, *Perfumes*; and some have used the Leaves instead of *Cloves*. It is a common thing with *Nurses*, to ease Children of the *Gripes*, to boil Bay-Leaves in their Food. The *Kernels* of these *Berries* are very like *Wheat*.

Of late Years abundance of these Trees have been raised and kept in *Boxes*, with curious round Heads, and single Stems of four, five, or six Foot high or more, and brought us over from *Flanders* and *Holland*; the great Use and Ornament of which in Parterres have encouraged us to raise them here. They appear in Tubs like *Oranges*; and, at pleasure, make a beautiful small Walk. And it is worth remarking here, that the wonderful straitness of the Bodies of these Trees before they come to *Head*, is owing to an ingenious Contrivance of raising the whole Stem in one Year in a hot Bed from a Plant cut down to the very Root; and that is effected by means of a perpendicular Frame of Wood made for that Purpose. *Lavender* and *Rue* are more reptile Ever-greens, and require much the same Soil and Culture from Slips.

The LAURUS-TINUS.

THE *Laurus-Tinus*, tho' it is a *flowering Shrub*, and might properly be taken notice of under the next Catalogue; yet being a beautiful *Ever-green*, generally planted in Parterres and amongst other Greens in the Wilderness-Works, I shall give its Place here. Some fancy there are several kinds, but I could never yet discover any other difference, but what might justly be attributed to the Soil or Situation. It is esteemed and respected in most Gardens both for its constant *Verdure*, and its beautiful *well-scented* Flowers, which appear, contrary to most others, in all the Winter Months. It makes handsome headed Plants in the Parterre, and refuses almost no Soil but those that are cold and spewy: And in *such* indeed a hard Winter kills them. Such Plants as are disposed to put forth near the Root, should be encouraged for the sake of *Layers*, by which it is chiefly to be increased. The richness of the Soil is the occasion of a strong shooting from the Root, but that hinders its Beauty both in *Figure* and *Flowering*. And for the sake of the last, I should advise rather to plant it against a Wall, or in a Wilderness at large, where it need not undergo so much the Severity of the Knife. For an unskilful Hand often deprives it of its greatest Glory.

PRIVET,

PRIVET, LENTISC and MATERNUS.

PRIVET is an Ever-green, much of late Years out of Fashion, tho' formerly almost the only Green used for Arbours and Hedges. It loves to grow amongst other stronger Trees and Hedges, being not so well able to support itself. It is easily raised by Suckers and Seed. The *Italian green Privet* is now got amongst us, having Leaves much like the Olive. It loves a hot Soil, will bear the Severities of our Winter, especially planted either in the Wilderness or Hedges, for it will bear clipping well; and because it keeps its Verdure all the Year, it is a great Ornament to the Garden either in Hedges or Standards. The *Berries* are like those of the Myrtle, and from them the Plants may be raised.

The *Lentisc*, *Lentiscus*, is another very beautiful Ever-green, brought originally from *Italy*, and therefore is of the tenderer Sort; but with a little care and shelter, it will thrive in a warm Soil, and may be propagated by *Suckers* and *Layers*. Mr. *Mortimer* recommends the Wood of this Plant for Tooth-pickers; and thinks the Mastick thereof to be a Specific for the Teeth and Gums.

There is also a Plant called the *Maternus*, which being a kind of *Phylerea*, is also good for Hedges, and may be as easily managed.

Having thus given an Account of Forest-Trees and Ever-Greens of all Sizes and Sorts; before I proceed to speak of Flowring-Shrubs, I shall say something in general of the manifest Advantage and Use,

Of Wood and Timber.

EVERY Man, to be a faithful Steward of his Land, ought to put it to that Use that will bring in most Profit. And Enquiry should be made into what may be gained by letting Wood grow on Land, and in what Cases it is necessary to compare the Benefit that may be made by employing it to *other uses*, with the Benefit made by *Wood*; which two Profits being different in every Country, there is no positive Rule to be given for it; but it is possible to *direct* how the Comparison may be truly made.

To which purpose there is a Method for making a Table shewing when Land affords Profit by bearing Wood: First, rate the Land at so much *per Acre*; then see what Price the Wood is in that Place, and what an Acre of young Wood will afford at *five* Years for small Hoops, Brush, Fagots, &c. which is the most benefit in some Places: What at *nine* Years for long Fagots, Bavins, &c. What at *fourteen* Years for Cord-Wood. One Acre will bear twenty Cord (a Cord being a Stack eight Foot long, four broad, and four high, every Stick at least three Inches about) and after fourteen Years the Body or Stem increases slower, the Boughs more; and many small Trees are destroy'd by the dropping of the more prosperous: Likewise what is to be made by Poles of *thirty* Years old, &c.

These Uses take up the whole Benefit of the Land: And for *Timber-Trees*, there must be known the Value of *Timber*; and we must suppose every Acre to bear one Hundred; and each Tree at seventy Years growth to have two Tun; and see what Satisfaction that will make for the long Expectation.

To reduce the Trees to one Hundred, many must be drawn out at *fourteen*, *twenty*, or *thirty* Years end, whose Value will be known as above, and Allowance is to be made against the Rent for their Value. Then Trees with their dropping sowre the Grass, 'tis true; but they kill *Moss* and *Heath*, which else would cover such Ground as will serve well enough for Timber-Trees, (the Experiment must not be made in good Ground) and kill Bryars, and secure it to bear Grass; so that the Profit of the Ground is hardly lessen'd by the Trees standing, there being still Food for young Cattel: I need not say any thing of the Mast or Profit of *Pannage*, which is yet something. An *Ash*, at *thirty* or *forty* Years is worth as much as an *Oak* at *seventy*.

If Land be intended at first for Timber only, Cattle may be turned in at six or seven Years: But this is not the most profitable way. I allow nothing for the *sowing*, because possibly the best way is only to *screw* Mast on the top of the Ground, never breaking it: I have seen they come up thickest where never cover'd. Nor for *Inclosure*, that may be charged

charged on the Land next the Wood, for the Tenant incloses against the Lord, in whose hand the Wood is suppos'd to be: And if it be a Waste, &c. it is already done.

When a *Wood* is fell'd, it must be inclosed from Cattle a Year before, and six or seven after, for any Trees but *Beech*: They are drawn as they may be sold; and Cattle hinder not the growth of young ones in their Places: But it is not so for other Wood. So that in short, the Table for purchasing Annuities, applied to the present Rent of the Land, will shew whether the *Wood* coming in so many Years, will at the end in that Place of the Country make amends for the stay.

I am confident many Places would find *Wood* the best Employment: It has this convenience, that it yields ready Money at any intermediate time, and still increases the Value of a Purchase; but it were good if one could tell the yearly Improvement of a Tree, as we can of Corn and other Products of Land.

With the Assistance of my inquisitive and learned Authors I have said a great deal about *Oaks* (in its proper place) and other Wood; notwithstanding which, Mr. *Houghton, F. R. S.* has plainly proved in an Essay publish'd, *Anno* 1683. that if no Wood for Fuel or Timber grew within twelve Miles of a Navigable River within this Kingdom, 'twould be its great Advantage; as to Trade, &c. And as I have known few Gentlemen that have turn'd their Arable or Pasture to Wood, I shall here make some particular Notes on some of Mr. *Evelyn's* Examples as to the Improvement of Plantations in general.

His first Instance is *Latimer's Wood*, in *Norfolk*, where 560 Acres of the best Saplings were worth but 3 *d.* each, but in 25 Years they were worth 2 *s.* 6 *d.* each, and in 50 Years about 10 *s.* for 1380 Trees were valued at 700 *l.* beside 40 *l.* made before; and the Land if it had been clear'd would not have Let for above 5 *s.* the Acre. Upon which I remark, that these Saplings grew on old Stubbs, which I presume makes them grow much faster than if they had come from an Acorn; but what the difference is, I won't determine; however, the Charge of Tilling and Setting the Ground with Acorns is to be considered; likewise 20 *l.* a Year for the 50 Years, be it more or less; all which I'll reckon for nothing: But at 50 Years end from the stubbing, the whole Growth was valued but at 700 *l.* with the Improvement it produc'd to the 50th Year, beside the 40 *l.* made some time before, whose Value I know not, but suppose it 100 *l.* in all 800 *l.* the whole Value of the Land by Wood.

But considering that Money at *compound* Interest doubles in something less than twelve Years, and 20 *l.* the Year, so reckoning amounts in 50 Years to upwards of 6835 *l.* there is no Comparison: Tho' the Acorns would have yielded something, as also some few Saplings to make way for the rest; but had all been cut down, the Improvement of the Land, beyond the Rent, would have exceeded all those, and I also believe the Rent too.

Another Example of Improvement of Wood is as follows: In 1636. an hundred Timber-Trees of Oak were sold for 100 *l.* but the Buyer going from his Bargain, they continu'd growing till 1671. and then they were sold for 560 *l.* and it looks like a very great Profit; but upon a nice Enquiry it will not be found so; for it is but an indifferent Oak whose Boughs will not reach one Pole on a side; and at that rate there can stand not many more than forty in an Acre; therefore I cannot imagine but that the Ground these hundred Oaks stood on, was worth 20 *s.* the Year, and so the 35 Years was worth in ready Money 21 *l.* 1 *s.* 2 *d.* which doubled once in 12 Years (as Compound Interest will do) and allowing one Year's growth more, the Rent would have amounted to 168 *l.* 9 *s.* 6 *d.* and the 100 *l.* would have yielded 800 *l.* both which make 968 *l.* 9 *s.* 6 *d.* then deduct from this the 560 *l.* the Trees sold for, and there remains 408 *l.* 9 *s.* 6 *d.* only the one Year is to be allow'd out of it.

The next Instance is of a Person who planted an Ash; and before his Death sold it for 40 *s.* I will not reckon the Ground this Ash grew on to be worth any thing; but suppose the Ash when planted was worth but one Shilling, and the Man liv'd 84 Years after, the Shilling would have amounted to six Pounds and eight Shillings, which is far better than 40 *s.*

Again, three Acres of barren Land sown with Acorns, in sixty Years became a very thriving Wood, and was worth 300 *l.* Because the Land was barren, I'll suppose it worth but 3 *s.* the Acre, 9 *s.* the three Acres; which for 60 Years was worth in present Money 15 *l.* 9 *s.* 7 *d.* which doubled every twelve Years makes 495 *l.* 6 *s.* 8 *d.* Suppose that the Tillage, Acorns, and Setting, came but to the third part of 15 *l.* 9 *s.* 7 *d.* it would be upward of 165 *l.* which together makes above 660 *l.* for the 300 *l.* my Author gives two more Instances, of very great Profits by Wood, but tells not how many Acres it grew on, therefore no Calculation can be made; but one (and perhaps both) grew in Hedge-Rows, and so the Land cost nothing.

But Mr. *Evelyn* shews, that almost any Soil is proper for some profitable Timber-Trees or other, which is good for very little else. Then he gives several curious ways how to sow and set Woods, to the greatest Advantage; as also a Calculation of one Captain *Smith's*, of the great Profits made from 1000 Acres in 217 Years; as also an Estimate what 20000 Acres would yield in 150 Years, which amounts to many Millions of Pounds *Sterling*; tho' I presume if so many were planted more than is, they would be worth little; or be, as King *Charles* the Second said to the Merchant, that said, if his Majesty would encourage it, the Merchants would make Gold as plenty as the Stones in the Street; to which the King answer'd, then 'twould be no more than the Stones in the Street: And a great deal of Navigation for Wood must cease, and by consequence we must have fewer Ships and Seamen.

My Author, partly as a Divine and partly as a Philosopher, concludes his Discourse on Forest-Trees, with Contemplations on the Weakness of the Beginning, and Grandeur of the Growth of Trees; and not only so, but of some being as hard as Iron, and others as solid as Marble; some like the Birch, yielding more Wine in a little time than the weight of the whole Tree; and the contemptible Vine, that without help cannot lift itself from the Ground, that yearly yields vast quantity of Wine, that is said to *cheer the Heart of Man*.

It has been observ'd, that Plantations of Trees attract and cause Moisture and Rain; and in some Places of the World, they have no other Water to drink, than what their Trees afford them; not only of their proper Juice, but from their attraction of the Evening Moisture, which impends in the shape of a Cloud over them. To what probable Cause this may be assigned, will be better understood, when the Nature of Vegetation is considered and explained. Of which in its proper Place.

I am aware that besides these Ever-greens here mentioned, there are many other Exotics of late Years introduced and naturalized amongst us, such as are found to bear the Severities of our ordinary Winters pretty well: Some of which (as also of the Exotic Flowering-Shrubs) I have just named and inserted in the Catalogue.



C H A P. III.

Of Flowring-Shrubs.

THAT I may compleat the Collection of Trees and Plants before mentioned, I shall now continue to discourse of *Flowring-Shrubs*, but yet with as much Brevity as possible, because these are generally well known, and their Cultivation as generally well understood.

Sena.] I shall begin with the *Sena*, of which there are commonly known two Sorts, the *Scorpion*, and the great *Bladder* or *Baslard* Sort, called *Collutea*. The *first* is the most beautiful; but *both* of them make a handsome shew with their yellow Blossoms both in Spring and Autumn. They are hardly able to support their own weight, and therefore are pleased with the help of a Wall, or to be set against an Arbour, where they are *ten- sile* and endure all Weathers. Easily increased by *Seeds*, *Layers* and *Suckers*.

Laburnum.] The *Laburnum* is rather a Tree than a Shrub, by some called the *Bean Trefoil*, its Leaves being an indented *Trefoil*, and its Pods resemble *Beans*. Its *Strings* of yellow Blossoms look very beautifully in the Spring, and therefore tho' this Plant grows sometimes to near 20 Foot high, it obtains a Place among the Flowring-Shrubs and in Wilderness-Work. It is easily raised from the *Seeds*, and grows in the most exposed Places.

Maracoe, or Passion-Tree.] I should not do Justice to this most beautiful and glorious Plant, if I did not a little dwell on the Description of it, as well as direct its Culture. The *Maracoe*, or *Passion-Tree*, by some called *Grenadille*, and the *Indian Creeper* or *Climber*, is a very extraordinary Plant, for the surprizing *Beauty* of its Flower, the constant *Succession* of them for sometimes more than six Months, the *Verdure* of its Leaves, the *Length* of its Shoots, and the *Largeness* of its Fruit. There are several sorts of this Plant, most of them impatient of extreme Cold; therefore here I am only to regard that one sort

so well known in *England*, which will endure our Climate pretty well abroad, and bear constantly Flowers, and Fruit sometimes.

Mr. *Bradley* has taken some Pains in describing the Nature and Culture of this Plant, to which I shall have some Things and Observations of my own to add. The known sort will certainly, if rightly managed, bear constant Flowers and sometimes Fruit, as the Climate and Soil will suffer. But because there will be a Necessity for a Description of the Plant either in Words or Figure, I chose to have the *Figure* thereof inserted, as conveying a better Idea to the Mind than any verbal Description.

From a View of this Figure, it may be seen the Flower has *ten white Petals* around it at equal distances, two Rows of *purple Threads*, a *Stile* resembling the Pedestal of a Pillar, dividing itself on the top into three Parts, and be set round at the bottom with Threads or Spikes erect. But as I said, *Inspection* is best; and I have said so much, only a little to explain the Superstition of the Friars, when they make the Flower the Representation of our Saviour's Passion; the great part whereof is forced to be help'd by pure Invention. The *ten Petals*, they say, are the *ten Apostles*; for one deny'd his Master, and the other hanged himself, and so were denied the Honour of a Place. The *Circle* of Purple Threads is the *Glory* commonly painted round the Head of our Saviour, and the *erect Spikes* are no ill Resemblance of the Crown of Thorns. The *Stile* in the middle of the Flower is the *Pillar* to which Christ was bound when he was scourged, the *Clasper* is the *Cord*, and the *Leaf* is the *Hand*. One of the *Stamina* with its *Apax* is a *Hammer*, and the *four others* make the *Cross*: But what is most desired to be thought wonderful and surprizing is, that every Flower is just *three Days* opening and shutting. It were happy for Mankind, if *Popish* Superstition were always thus harmless!

But let us see what is to be done with this pretty Plant, that it may display all its Beauties. That it delights in *moist* and *warm* Places is most certain, both what Mr. *Bradley* has told us from his Correspondents, and also from what I have seen my self; and therefore to surround the Roots often with Cow-dung, or to set it against a constant drain or sink of Water, is an Advice to be followed, if it can at the same Time have a *South* Aspect; for the Cow-dung will keep the Roots cool and moist, and the Aspect will be its defence and security in the Winter, which sometimes kills this Plant down to the Roots; but then it will be sure to revive again, which by the way is a better Emblem of the *Resurrection*.

But still there is a good deal of Care to be used in the *Pruning* this Tree, that it may bear Fruit; for to neglect it wholly, or to prune it too much, are equally injurious. He that knows how to prune a Vine cannot miss of doing this as he ought. If you cut an old Vine down to the old Wood all over, tho' *that* be the way to get good Wood next Year, yet *that Year* you must expect no Fruit; or if you leave too much, or a confused Quantity of Wood, little good Fruit can be expected. Thus you must discreetly order this Tree as a Vine, leaving every where some of the last Year's Wood four or five Inches long, the Tree ending in Points, some shorter, some longer intermixt, and not too many neither; for nothing is more apt to be confused than the Luxury of this Plant. In short, prune it as you prune or *should prune* the Vine, and you cannot err. But because the *earliest* Blossoms commonly set for Fruit, it is a good way to set some Frames of Melon Glasses before the upper Parts of the Tree in *March* and *April*, to make the Tree *push*; and if you can procure Blossoms by the latter end of *May*, you need not fear a Succession of Fruit, especially if you give it plentiful Watering in some of the driest Months. The Fruit is in shape and colour like a *Lemon*; but the inside is more like a Pomegranate, of a sharp, but not unpleasant Taste.

I have often wondered, considering the Beauty of this Plant, what a fine shew it makes against the *South* side of an House, running sometimes eighteen Foot in one Year, and how easily the Tree is raised both from Suckers, Layers and Cuttings, that it should not be more propagated than it is. For indeed no Place of Beauty should be without it.

We are told that Mr. *Whitmil* of *Hoxton* has a new sort of dwarf *Passion-Tree* hitherto unknown, which bears Fruit very well upon small Plants even in Pots, by the help of Supporters. One of them was brought last Winter to *J. Tempest*, Esq; with Fruit upon it; and from the Seed this Year I have raised several Plants.

Honey-Suckle.] The *Honey-Suckle* or *Wood-bind* is of various sorts, distinguished by their Colours and Times of blowing. All of them bear pretty sweet-scented Flowers, and some of them come early in the Spring, and therefore deserve our Pains in propagating them. The Scarlet Flower is reckoned the most beautiful and blows late. They are called *Wood-Binds*, as they are *twining* Plants. They are easily raised from *Layers* or *Cuttings*. They do best in Arbours and against the sides of Houses, only they are apt in such Situations to be

be infested with a sort of Fly or Cantharides; which spoils all their Beauty, and makes them become offensive. They look well among and about Trees in Avenues, and tho' they are not well made to support themselves, yet they may be formed into Heads from a single Stem not too high from the Ground; and as soon as their blossoming is over may be clipp'd.

Pomegranate.] The *Pomegranate*, which finds a place in this Catalogue, is that of the *double-flowering* Sort, whose Blossoms are of a most beautiful Scarlet Colour. Some set them in Arbours, and others advise them for Hedges of Wilderness-Works; but both these ways seem too hazardous for a tender Plant. The great Beauty and Glory of their Flowers in *August* and *September* highly merit a tenderer Regard, even to have the help of a Shelter or Wall much in view and facing the *South*. But there is another sort bearing single Flowers of the same Scarlet, which in some Years and Situations *set* for Fruit. I have seen above an one Hundred ripe upon one Tree at *Cue-Green* near *Richmond*. They are both propagated from Layers, and may be Transplanted either in Spring or Autumn into a light warm Soil.

Solanum.] The *Solanum* or *Night-shade* is of several Sorts. There is the *Shrub Night-shade* which has a woody Stock with dark green Leaves; and there is the *Tree Night-shade*, arising with a wooden Stem a Yard high, with green Leaves and white Flowers like Stars: But neither of these are comparable to the Beauty of the common Sort which grows in Hedges (not able to support itself) when it happens to be variegated in its Leaves. For then is discovered no less than four Colours all at once in Autumn, *viz.* Purple Blossoms, Scarlet Berries, and at the same time green Leaves edged with white or cream Colour. This Plant must be supported with Help against a Wall; but it will do on any Exposition. The tender weak Branches should be removed every Year, and it will not fail to replenish the Wall with new ones in the Spring, which attract the Eyes of the Curious, and Lovers of Beauty.

Mesereon.] The *Mesereon* or *Dwarf-Bay*, rises to two, three or four Foot high, as they happen to like the Soil; for tho' they are strong and hardy Plants, yet they are nice and something hard to be pleased in their Roots. There are two or three Sorts of them. One which bears the *red* Flower, another which bears the *Peach-bloom* Flower, and another the *White*. These Flowers are succeeded by beautiful *Scarlet* Berries, and sometimes by *Yellow* ones, not so beautiful tho' more rare. These Trees have two Excellencies which make them universally esteemed. They are the first Trees which put us in mind of the *Spring* by explaining their beautiful Sweet-scented Blossoms even in *January*, and continue them till *March*; and then give us, not a *Taste*, but a *Sight* of their beautiful Berries all the *Autumn*. These Berries are hot to a very violent degree; but yet the *Robin* is greedy of them, and they readily grow after they have passed thro' his Body. By which means they are scattered and raised in great Abundance.

Gilder-Rose.] The *Gilder-Rose* bears Bunches of white Blossoms in *May*, as big as a large Ball. It is a hardy Plant, grows in almost any Soil, and is increased by Suckers. But not being willing to be chastized by the Sheers, or kept in any exact form, he submits to be placed among the Plants of the Wilderness.

Rose.] There are more Varieties of a *Rose* than of any other Flowring-Shrub. And if you consider the *Beauty* of their Flowers, the *Fragrancy* of their Smell, the *Easiness* of their Culture, and the *Continuance* of their Blowing, one or other of them sometimes for nine or ten Months, it will easily be granted, that nothing amongst this Tribe can better deserve the Room and Place they require. But because there are so many Sorts, it may be sufficient to give a Catalogue of them in their order, as commonly distinguished by the Gardeners; and then make some Remarks where particular Sorts require them. That which ought to have the preference to all others for Beauty and Colour, is the *Yellow-Rose*, single and double: But the first Blower is the *Cinamon-Rose*; then follow the *Monthly-Rose*, and the *Cluster-Monthly-Rose*; the *Austrian-Rose*, the *Damask-Rose*; the *Province-Rose*; Mr. *Hurt's Rose*; the *Belgic-Rose*; the ordinary *Red-Rose*; the *Rosamundi*, or *York and Lancaster-Rose*; the *Marbled-Rose*; the *Velvet-Rose*; the *White-Rose*; the *Rosa-Canina*; the *Musk Rose*; the *Ever-green-Rose*; and the *double-blossomed Sweet-brier*: With some others of less note.

The best, tenderest, and more excellent Sorts have succeeded very well by grafting on the Stock of the common *Sweet-brier*, or by inoculating on the common *Rose* at *Midsummer*, which is the best way of propagating the *double Yellow-Rose*, whose Flowers are so very beautiful, and the Tree so little known, that I would prevent Mistakes in planting it, by saying, that it should by no means be planted in a Place too much exposed to the Sun, nor in too light a Soil. The *fewer* and the *stronger* the Branches are left, the *fairer* will the Flowers be. The *Monthly*, and *Cluster-Monthly-Roses*, should be set against a *South* Wall

Wall, to make them blow early and late; for in such Station, with the help of a little screening and defence, I have known them bear till the beginning of *December*.

Altho' the several sorts of *Roses* differ in their times of ripening, yet their Culture and Propagation is much the same. They love a Marle or loamy cool Soil inclining to moisture, and are raised from *Layers*, *Suckers*, or even *Cuttings*; which *last way*, tho' it is not the most expeditious, yet is what I would recommend rather than the *two former*, which commonly produce a multitude of *Suckers*; and *Suckers* are always Robbers and great Weakners of a Plant, and spoil its Beauty and Uniformity, which should always be regarded. Take therefore the very strongest and straitest of the last Year's Shoot of a *Rose* from the Root, and cut off from the bottom every thing that looks like Fibre or Bud, and so examine it all up the Stem till you come within three or four Inches, or as many Buds, of the top where you intend to shorten it, removing the Buds with a Knife. And in this manner keep always a Quantity in the Nursery planted in the Spring in a cool Place, agreeable to the direction of the *Gooseberry* and *Current* spoken of in the Fruit-Garden. For this Method secures it for ever from putting forth *Suckers*, and consequently strengthens the Plant. And this is the Method you are to follow, if you intend to inoculate the *weak* and *tenderer* sorts on the more *robust* and *stronger*; for thus they will always form beautiful Plants, viz. handsome Heads on strait Stems.

Lilac.] The *Lilac* or *Pipe-Tree* is of two sorts; the one bears a *white*, and the other a *pale blue* Flower, opening in *April* and *May*, and affording a very sweet Scent, hanging down in Bunches like *Plumes* of Feathers. The *White* and the *Blue* agreeably intermixt look very pleasantly in Walks or Wilderness-Works. They are raised from *Suckers*, which they are apt to put forth plentifully.

Almond.] The *Almond*, both *Standard* and *Dwarf*, is of the *Peach-kind*, and until the large *Plumb* was found to be better, was used as a Stock for the *Peach*. But the chief use of the *Almond* now in *England* is for the Beauty of its Flowers, which appearing *very early* and of a *pale red*, attract every one's Eye to them in the Spring. The *Standard* sorts grow strait, and make very handsome Heads, and in good Years bear tolerable Fruit *without* the help of a Wall, and with it are more certainly ripe. The Kernel is generally bitter, but some think that often removing them makes them grow sweeter. The *Dwarf* Kind is smaller in all its parts, something tenderer, and valuable chiefly for its Blossoms, and is raised from *Suckers*. The way of raising the *Tree* is to set the Stones with their outward Coat in *October*, in the Place where they are to stand if possible; for they take a Remove very unkindly. But Care and Caution overcome great Difficulties.

Jessamine.] The *Jessamine* hath great Varieties; but what concerns me at present, is to mention the sorts that will endure our Winters without Housing, of which sort are the common *White*, the *Yellow*, the *Strip'd*, and the *Persian* or *Purple Jessamine*. The first sort hath Branches of a deep green Wood flexible, opening at their Ends at *Midsummer* into a Tuft of divers Flowers, which are white and of a delicate Perfume; which Flowers with us commonly fall away without seeding, and therefore the Plant is to be raised from *Suckers* (which it is apt to put forth plentifully) and *Layers*. It is generally used to adorn the outside of an House, where it is very agreeable both to the *Sight* and to the *Smell*: But it is also a great Ornament to the large Plantations, and amongst the Flowering-Shrubs; where it may be trained up to a *beaded* Plant, and will support itself: In which Shape it may be set in Pots to adorn the Chimnies in the Summer Months.

The *Yellow Jessamine*, by some called the *Jonquil*, from its resemblance to that Flower. From the slender Stems of this Plant, garnished with oblong sharp-pointed Leaves, come the *Yellow* Flowers, consisting of five Leaves in form of a Star. If it come (as some fancy) originally from *Mexico*, it is much it should be so *hardy*; for no Winter, nor even no Neglect hurts it: Its Flowers have little smell, and therefore must give the other the Preference; but yet it makes a pretty Variety, and may be raised as the other, from *Layers*, &c. Both these are proper Stocks for most of the tenderer sorts to be inarched or inoculated on; as also for

The *Strip'd Jessamine*, which is certainly one of the most beautiful of the whole Tribe of *Flowering-Shrubs*; having its Leaves and the greatest part of the young Wood tinged with a *Gold-coloured Yellow* intermix'd with the *Green*. For tho' the Blossom is no way affected with the *Yellow*; yet the Leaves and Wood being of so beautiful a Die, the whole Plant soon attracts the Eyes of the Beholder. This may also be propagated by *Layers* and *Cuttings*; but it is also obtained by *Inoculation* on the plain *White*; and (as I have elsewhere largely explained) a Bud so put into the common sort hath a strange Virtue to communicate its Die to the whole Plant, even on Branches coming from the Root on the other side of the Tree, whereby the *Circulation* of the Juices or Sap in Plants, as

the Blood in the Veins and Arteries of Animals, is undeniably proved to a Demonstration *.

The *Persian Jessamine*, which bears Flowers of a *purple* Colour, is also raised with us from *Layers* or *Suckers*, and loves a light, warm Soil, where it will bear our Winters well enough; and though it is but a small Plant, yet it makes a pretty shew amongst the Varieties of the Wilderness-Works and *Flowering-Shrubs*. This precedes the other in flowering, and yields most pleasant and well-scented Blossoms. There is also the *Indian Scarlet Jessamine*, which with the help of a Wall and its Tendrils rises to a great height, and affords a *Scarlet* Blossom: But it must be used tenderly.

Althea Frutex.] *Althea Frutex*, or *Shrub-Mallow*, is of two sorts, the *White* and the *Purple*; they are both equally hardy, and endure the Winter. They may be raised either from the *Seed* or *Suckers*. The Blossoms resemble those of the *Mallow*, from whence it has its name, and shew themselves very beautiful all the Summer till the Frost overtakes them.

Tulip-Tree.] Mr. Bradley has made it his Observation, that the *Tulip-Tree* will not live in exposed Places, but only in the *Wilderness*, and amongst Trees designed for Groves. Its Leaves are somewhat like those of the *Maple*, and its Flowers, which begin to open in *July*, are only on the Extremities. It is a Native of the *West-Indies*, and grows chiefly in *Virginia* and *Carolina*; but yet managed according to its Nature, is easily *Naturalized*. There is a large one in my Lord *Pembroke's* Garden at *Wilton*, and another at my Lord *Peterborough's* at *Parson's Green*; but I think its resemblance to a Tulip is hardly sufficient to challenge the Name. The *Petals*, or *Flower-Leaves*, are of a *yellow* Colour, a little *variegated*. The *Fruit*, which is like the *Cones* of the *Fir*, doth not come to Perfection with us; but as they are brought from *Virginia*, they may be sowed in Autumn, and kept sheltered in Pots during the Winter, and they will come up without the help of a hot Bed in the Spring. They must be used *tenderly* for the first four or five Years, and so may be easily used by degrees to our Climate, being set in a warm Sand.

Spirea Frutex.] *Spirea Frutex* is a small Shrub, seldom rising above three Foot high. Its Beauty is chiefly in its Flower; for it bears a *Peach-coloured* Blossom in *August*. It is an hardy Tree, and may be raised from *Suckers* or *Layers*.

Spanish-Broom.] There is no great Beauty in the Leaves of this Plant; but its Flowers of little Pearls, or something resembling the Butterfly, make a pretty shew. There are two sorts of this *Spanish-Broom*, one with *White*, and other with *Yellow* Flowers, bearing their Seed of a *shining Red*. The best way to raise them is from the Seed. The *White* sort is tender; but the *other* is a hardy Plant, and easily cultivated from the Seed. But as it has long and slender Tap-Roots, great care should be had in transplanting them; for Nature best directs what it wants, and therefore *shortning* them too much will be against Nature. If the Farmer and Grazier would not too much wonder and smile, when I mention the *English Broom* and *Firze*, I should think them not amiss to be planted amongst the Shrubs of the Wilderness. They both answer the Sheers, look green all the Winter, and bear pleasant yellow Blossoms. The *latter*, besides its being as governable as the *Engb*, bears its Blossoms the whole Year round, which no other Shrub (I think) can boast of.

Syringa.] *Syringa* is another sort of *Lilac*, which if planted in a shady Place will grow almost in any Soil. It bears many Clusters of Flowers of a *faint White*, or *Primrose* colour; yielding a strong Scent, some think, not much unlike the *Orange Flower*, but stronger and less grateful. The late curious Botanist, Bishop *Compton*, has observed, that the Leaves of this Tree taste like green Cucumbers. It is much planted amongst the *Flowering-Shrubs* of the Wilderness, and is raised with great ease from *Suckers*, which it puts forth plentifully.

Dog-Wood.] The common *Dog-Wood* is a Dwarf-Tree or Shrub, that grows frequently in Hedges, bearing white Flowers and red Berries, the Wood whereof is of great use to the Butchers, but especially to the Silver Wire-drawers, to clean the holes of their Plates from Wax, &c. But there is a *Virginian* sort that makes a Tree as big as a Cherry-Tree, which has likewise in *April* white Flowers and red Berries; the Roots whereof, boiled in Water, the *Indians* use to heal green Wounds.

Sea-Ragwort.] *Sea-Ragwort* is another pretty Flowering-Shrub. It has an uncommon light Green *without*, and a white *within* or underneath the Leaves, which makes some call it the *powdered Beau*, and it produces Clusters of *Yellow* Flowers about *Midsummer*. A

* See Clerg. Recreat.

very severe Winter is apt to kill it; and therefore it is proper to have some of it in Pots, which may be sheltered in Extremities. And this will afford a Supply; for it is easily raised from *Suckers* and *Slips*, and grows almost in any Soil, if it have moisture.

Barba Fovis.] This is a Shrub shooting a Stalk about a Foot and half high, which is hard and woody, covered with a downy Rind. At the end of the Branches appears a Butterfly-like Flower, which, after it falls, is filled with a roundish Seed. This is only a Plant of Curiosity, and is ornamental amongst the Flower-Plots. But it must be well watered.

Virgins Bower.] This Plant is of a twining, climbing Nature, and must be supported. It bears Flowers of a Violet colour, which grow in great Numbers, almost covering the Plant in *July* and *August*. It may be raised from Layers and Cuttings: Will do against Arbours and Walls, or among the *Flowering-Shrubs*. There are also single ones both *Purple* and *Red*; but the double ones of both Colours are most esteemed. The more they are pruned, the better and fairer are the Flowers of both sorts.

Periwinkle.] This Plant, tho' it is a sort of *Reptile*, hath great Varieties. For there is the *broad-leaved* Periwinkle; the *narrow-leaved* Periwinkle; the Periwinkle with *white* Flowers; the *double flowering* Periwinkle; the *yellow strip'd* Periwinkle; and the *Silver strip'd* Periwinkle with purple Flowers: These two last especially make a fine shew, both with their Flowers and painted Leaves, which are also *semper virent*. It delights in the shade, and even under the droppings of other Trees. But the way to make it shew its Beauty most, is to make it hold up its Head; and that is by tying up its Branches to small Stakes, and having thus by the help of Sheers made it to form a sort of Pyramid, it may very well be reckoned a Companion for *Flowering-Shrubs*. There is no difficulty in propagating it; for it grows from every Knot or Joint: On the contrary, there should be care used to plant it where it may not over-run the Ground.

Many more there are of this Kind more common and of less note, which I shall not think fit to trouble the Reader with, as either growing wild in the Hedges, or else discover little or no Beauty. But (as I have before remarked) there are also many *Flowering-Shrubs* from abroad introduced amongst us, and are by Experience found to be hardy enough for our ordinary Winters; some of which I have therefore just named in the Catalogue.

Thus much may suffice to be said concerning *Forest-Trees*, *Ever-Greens*, and *Flowering-Shrubs*: But because there are Hints to be given about Growth and Planting, which may be thought useful, I shall add here one Chapter more.



C H A P. IV.

Of the best Ways and most general Seasons for Setting Plants, &c.

AL L Trees, Shrubs, and Plants of a woody Substance, that have Bodies able to endure the Cold, are best set *before Winter*, as soon as the Leaves begin to fall; and a Quickset Hedge of this Season is observed by far to outgrow another of the like Kind planted in the *Spring*. Artichokes and Asparagus (whatever the modern Practice may have been to the contrary) do exceedingly well being planted at this Season of *Autumn*, if set in a rich warm Mould, and something defended the ensuing Winter from violent Frosts. For *Artichokes* it is sufficient that a Trench be cast up between the Rows for the defence of the Roots: And (as I have several times observed) *Asparagus* is a very hardy Plant, and needs no shelter after the first Year.

For Herbs and choice Plants, especially those that are set without Roots, it is most proper that they be set in the *Spring*: Such as *Hysop*, *Thyme*, *Savory*, *Marjoram*, *Wall-flowers*, *Pinks*, *Carnations*; with this Caution, that by how much more tender and delicate each Plant is, in regard of Cold, the *later* it requires to be set, and in the *warmer* Place.

As to all bulbous and tuberous rooted Plants, it is accounted the best way both for their Preservation and Improvement, that they be taken up every Year out of the Ground, and kept some time within doors in dry Places, where they may have *free Air*, and *little Sun*.

Sun. Tulips, Ranunculus and Emonies, should be taken up before *Midsummer*, and kept within doors till *October*, which will tend mightily to their Enlargement and Increase: Tho' *Fritelaries, Peonies*, and *Crown-Imperials* are something impatient at Removes, and thrive better without it. There is, without doubt, a Discretion to be used with respect to the several Kinds, and the Quality of the Ground where they are to grow. The *Narcissus* and *Crocus* are commonly taken up first; generally when the Flower is gone and the Leaf withered, and the Bulb full, is the best Season. And then as to those Gardens which lie cold and moist, and are apt to be overflowed or soak'd with Water in the Winter, (for Summer-Wets never hurt them) the *later* bulbous Roots are set, the *better* and safer from danger.

Concerning Plants that are ordinarily set abroad and left without future Care and Attendance, little need be said here; only these Observations (which I am forced to repeat) may not be amiss to be taken in by the way; that it is greatly his Interest that minds the thriving of his Plantations, (whether they be large or small Trees) that they be set so, that the Roots may only just run under the Turf, in the Surface of the Earth; the higher the better; especially if due care be taken the first Year to keep them moist at the Root with Weeds or long Straw; or, which is still best, with being paved round with Stones and afterwards well watered.

I have seen some Plants so buried in a depth of thick Clay or Gravel, that they could not shoot for many Years any but weak and sickly Branches, hardly a Span long; whereas others of the same Kind planted high and according to Art, thrived abundantly even in the same Neighbourhood; nay, the very same Trees, commanded to be raised, have been observed to exert their natural Vigor to a Wonder.

Orchards require to have the Ground *all over* trenched, *i. e.* the upper Surface to change place with the lower Soil, and the Trees to stand at eight Yards distance in the *Quincunx* Order. Without this Care and Diligence it is not to be hoped, (ordinarily speaking) that you will receive the expected Fruits of your Labour. And if the Ground is shallow and subject to too much Moisture, all Tap-rooted Trees are to be rejected, or you must plant them very high, without making any Hole, with untried Earth superinduced; and after that, lay on a load to every Tree of such Dirt as is found in the Streets, and dispose it in such a manner as to remain *concave* round the Tree, the better to retain the Dews and Rain. The want of this Provision and Practice is the occasion that *Orchards* are to often found unthriving, and the Trees observed to be *stunted* and *dwarfish*, and the Stems and Branches to be covered over with Moss.

For the planting of *Woods* in general, and for the increase of *Under-wood*, the following Method is generally approved and found right; *viz.* to cast up double Ditches, and plant the several sorts in form of Quicksets, sowing also Keys, Acorns, and Seeds on the Banks in orderly Rows. The best time of doing this, is as soon as the Leaf is fallen, without any regard either to the *Moon* or *Weather*. The Plants propagated in dry and more sound Grounds, are *Oak, Ash, Elm, Sycamore, Maple, Crab, and Thorn*. In the more moist Grounds and boggy Places, the *Poplar, Willow, Salrow, and Osier*, are with most reason contrived to be planted, and all of them by *Truncheons*; but yet with this Caution, that they should grow rather *by* than *in* the Water: For none of them will grow *long* or *much* in such Bogs as have no soundness of Ground, and are under Water the greatest part of the Year.

As to the vulgar Notion of raising *Elms* from *Chips*, that must be a mistake, which the Country-man was probably led into from his observing *Elms* to grow from amidst the Grass, where *Elm-Chips* were scattered on the felling of large Trees: But the young Plants which have been there observed to rise, must necessarily proceed from Suckers arising from the old extended Roots remaining in the Ground. And these Suckers may easily be mistaken to arise from the Chips, because they always come upon the felling of *Elms* where Chips are found, and grow at such distances as Chips are ordinarily scattered.

As to the Growth and Increase of Vegetables otherwise than by *Soils* ordinary and artificial, or from the Surface of the Earth, I think it is demonstrable and plain by every day's Experience, and by what I have said of the continual Augment of Plants set in *Water*. For besides the Slips of *Mint*, these which follow will grow and flourish from the Nourishment they receive from *Water* alone, not excluding the Terrestrial Matter it contains; *viz.* *Penny-Royal, Bugle, Prunella, Water-Cross, Purple-Grass, Periwinkle, Crow-foot, Brook-Lime, March-Mallows, Laurel, Scordium, Tripolium, Knot-Grass, Panax-Coloni, Fetherfew*, and some others; not meaning those which will make some Pushes of Vegetation both in Leaves and Roots, and yet soon after die, of which there are a great many.

But

But further than this, I have already observed, that even the *Air* itself contains so much vegetable Matter in it, that some Plants will flourish and grow by the Help and Virtue of that Nourishment alone; as most of the bulbous Roots will do, as well as the *Sedums* and *Orpines*. However, to that reasoning I think fit to add in this place, that *Onions*, *Tulips*, and all bulbous Roots, tho' by virtue of the Air and what it contains, they shoot out a green Leaf, yet that they constantly much *lessen* in their weight, which is a demonstration that they *exhale* more than they *receive*; and their Growth is little more than a Motion of the same Parts, or rather another Order or Situation in relation to each other. For the *Onion* particularly has the thicker Coverings of the Bulb very much stretch'd out, and each Covering, as it increases in Length and Breadth by rising into a Leaf, so its Bulk, while it covered the Bulb only, decreaseth proportionably, and is moulded into a thinner and more largely extended Vestment.

Thus divers *Sedums*, *Orpines*, *Tythmals*, and such like Plants, known to shoot and grow in the open Air, and are supposed to increase and to be augmented thereby, tho' the Plants grow well; yet upon Experience, are constantly found to lose their *weight*. Thus again *Aloes*, tho' it have been hanged up in the Air with a Cloth dipt in Sallet Oyl, and is observed for many Years to put forth new Shoots and Leaves, yet it always grows less and less in *weight*, till at last the oldest Leaves falling off, and new ones succeeding, it grows to *nothing*.

It may not be amiss under this Head, to take notice that in planting Avenues or other Rows or Clusters of Trees, intended for Beauty and Ornament, great care should be taken and judgment used to chuse *strait*, *handsome*, and *well proportioned* Trees. For besides the uneasiness that every deformed thing gives to the Beholder, there is nothing more certain than this, that in all Animal Nature every thing that is *strait* and *well proportioned* thrives and flourisheth most; and on the contrary, every thing that is crooked and out of shape, is more or less dwarfish, stunted and unthriving; as having the Ducts and Passages for the Circulation of the Blood or Sap less open, or some way or other obstructed. Which Obstructions are the occasion of those Disappoints which careless Planters meet with, when tired with Expectations of having their Desires answered, they *late* (too late) see their Error in planting ill-chosen crooked Trees.

Whereas, if Discretion and Judgment be used in the Choice of strait-bodied Trees, with shining Bark; (a great Indication of Health) and such Trees, designed for Ornament or Use, or both, be planted according to the Rules laid down, and in the right Seasons, in *Autumn* or early in the *Spring*, (tho' the first is to be chosen) you may, without Presumption, soon expect to see Nature exert her self to the utmost in all her regular Operations, and draw up your Infant Plants by swelling and extended Progressions to their full Stature, so as to answer your End in planting them, and excite your Thankfulness to the Author and Disposer of all Things.





A
NEW SYSTEM
OF
AGRICULTURE
AND
GARDENING.

BOOK III.

Of the Fruit-Garden.

ALTHO' I have some Years since published to the World my Thoughts on this Subject in several Treatises, which have been very kindly entertained and accepted: And altho' several others also have followed me with many ingenious Observations and Improvements on Vegetable Nature, whereby the Art of Gardening is become a Science now pretty well understood; yet for as much as this Treatise is intended to be a compleat System of *Agriculture* in all its Parts; and every day's Experience gives fresh Light, towards assisting Nature in her generous Inclinations for the good of of Mankind, I have thought it reasonable to explain and make easy the whole Myttery of chusing, raising, planting, and pruning the *Fruit-Garden*; that the whole by a regular, and orderly Government, may bring *Pleasure* and
Profit

Profit to the Owner; whereby two of the greatest Views of human Life are agreeably and innocently entertained and answered.

But that I may proceed in some plain, easy, and regular Method, I purpose to begin my Directions from the first Rise that a Man's Desires take, who is to begin *de novo*; that so having before his Eyes as it were *Tabulam rasam*, as a blank Paper he may write upon it what is proper and most likely to answer his Purpose every Step he takes in a proper Order. And if so be a Man's Lot and Circumstances be such, that he finds it is not in his Power or Choice to follow the exact Method laid down, he may easily break in upon it, and either *chuse* or *refuse* what is *for* or *not for* his Purpose. This being premised I shall begin to treat,



CHAP. I.

Of the most desirable Situation for a Fruit-Garden.

OUR Seasons here in *England* are most commonly so very uncertain, especially in the Spring, when Fruit-Trees are making their first Attempts to reward the Owner, that it is very desirable to have it in one's Power to chuse a proper Situation; such as may in great Measure prevent the Inconveniencies of the merciless Winds, and the Mischiefs attending the two Extrems of *Wet* and *Dry*; *Hot* and *Cold*. To this Purpose an easy Descent or Inclination of the Ground facing the *South-East* is much to be desired, always supposing that every Quarter but *that*, be well guarded with Trees at a convenient distance; which Guard, if it is not already found, must instantly be made, that no time may be lost: But the *West* and *South-West* Quarters call for the Master's more immediate Vigilance and Care; because according to the constant Observations I have made for many Years, the Winds from those Quarters reign for near three Parts in four of the whole Year; and consequently as they make the greatest Havock and Desolation in a *Fruit-Garden*, so they call for a more immediate and effectual Remedy; without which, whatever some may think, who trust to Buildings and high Walls, which only create Eddies, most of the Planter's Labour and Charge will be fruitless.

An easy Descent or Declivity to the *South-East* is also desirable for these following Reasons. (1.) Because such Position receives the greater Quantity of the Sun's Rays, and consequently more of his ripening Influence. (2.) Because it makes a natural, and yet not too hasty a Drain for excessive Winter-Wets, oftentimes destructive to tender Trees and Plants. (3.) Because it causes a natural Guard and Defence against the *North* and *North-West* and *West* Winds; especially if the Rise of the Ground behind the House and Garden towards those Quarters be any thing considerable; which is much to be wished for.

Under these Circumstances, and with the Advantage of a good Soil, (of which I shall speak presently) I venture to repeat what I have formerly said, and that with more Assurance, because grounded upon further Experience, That three or four Degrees of *Northern* Latitude, is a trifling Consideration, and should discourage no Lover of a Garden from attempting to plant and propagate the tenderest Plants, and the best and latest Fruits.

The Bishoprick of *Durham* lies near the Latitude of 55, inferior to few in Riches and Beauty; we are presented here with many right and proper Situations; and tho' the Art of Gardening has but in a manner just reach'd these Parts, yet where there has been any tolerable degree of Art and Diligence used, and the Soil and Situation favourable, I see nothing desirable in a Garden wanting: For altho' my own Situation is upon a Hill unguarded, and I have the misfortune to be deprived of all Hopes of getting either much or good Fruit, unless I could assuage the Fury of merciless Winds; yet amongst many of my good Friends and Neighbouring Gentlemen, I cannot but mention it with pleasure, that I never eat *more* or *better* Fruit in my Life, even of all the *best* and *latest* Sorts, except *Grapes*; which for want of Courage are found planted but in few Places; and where they are found, miscarry only for want of Skill in pruning; as I have already given occasionally some Demonstrations.

In short, every Gentleman or Clergyman that hath but the desirable Situation here mentioned, or indeed but some good degrees of it, let him not imagine he is too far *North*, but take courage, and flatter himself with Success in planting, when I tell him the Bishoprick of *Durham* affords Plenty of the tenderest Peaches and Nectarines, and even the late *Katherines* in perfection.

In the Garden of my good Friend Dr. *Hudleston* at *Durham*, besides many other tender Curiosities, the *Passion-Tree* or *Maracoe* presents itself in great Beauty and Glory; and tho' the Tree is but six or seven Years old, hath already made some promising Attempts for ripe Fruit; and that Reward I doubt not will be granted in a few Years more: But indeed the Plant (tender as it is) grows in many other Places like a Weed, and where it is discreetly placed, neither refuseth nor dislikes the Climate; which I take this occasion to mention, that I may confirm and strengthen what I have formerly laid down and supported by a Table of the Quantity of the Sun's Heat in several Latitudes from 44 to 56; whereby it appeared, that tho' three or four degrees of Latitude do produce *some* considerable difference in the degrees of Heat and Cold; yet that *that* is perhaps less considerable than is commonly thought; and consequently that there is more weight laid upon that difference than it will bear, when a Gentleman suffers himself to be discouraged from planting and managing *Peaches* and *Vines*, because he happens to live under 54 or 55 degrees of Latitude.

Which Calculation led me formerly to say further, "I am so sensible how little there is in that Disadvantage, that if the Rules laid down be but followed, I am sanguine enough to hope for Success even in the most *Northern* Part of this Kingdom; and it is with Pleasure I expect to hear of good Grapes at *York* and *Durham* too." Moreover, it is not to be forgot what I have formerly observed also, that a *Northern* Latitude hath this Advantage; that from the two Equinoxes in Summer, (the time of ripening Fruits) there are no less than one Hundred Hours of Sun-shine at *Durham*, more than there are at *Plymouth*, as might easily be demonstrated by a Table.

Upon the whole. When the desirable Situation here mentioned for a Garden *can* be had, I think it should, almost at any Rate, be chosen; and when it *cannot* be had, either in whole or in part, the first Care is how to mend it by Artificial Shelters of Hedges and Rows of Trees, and by Conduits and Drains, as they are found to be wanting.



C H A P. II.

Of the most desirable Soil for a Fruit-Garden.

THE Situation of a Fruit-Garden, tho' it is a very inviting Circumstance; yet is not the only thing to be regarded. A good *Soil* will do Wonders, where a bad one will do almost nothing without much Time, Labour and Charge. The Soil therefore (if one were to chuse) that I should call a *good one*, is a rich loamy Earth, with near an equal Mixture of Sand and Clay two Foot deep, and under this either a Sand or Gravel, or something else analogous to them, rocky and chiselly, or the like.

I do not say there is no other *good* but such; for Chalks and Marles and some Sands will do exceedingly well with due Mixtures superinduced; but the *natural* Soil I would chuse, as best of all, is what I have already mentioned, and if it is *untried* will last many Years without mending: And therefore should, I think, as near as may be, be the Standard of all *Artificial* ones.

I am sufficiently sensible, that this *natural* desirable Soil cannot ordinarily be had at Will or Pleasure; and therefore it may be expected, that I should give some Hints and Directions how to mend Defects. The *Fruit-Garden*, and that only, is *now* in our View: So that according to my own Principles long since established, and which I know to be right, I banish all Dung whatsoever as Poison, and a Nuisance, for Reasons I shall hereafter give. If the Soil then is Clay, superinduce Sand; if Sand, Clay; and the bottoms of Ponds are the proper Mixtures and Manures for it. The one makes a convenient Separation of the Parts of Clay, and the other fixes the Sand: And herein lieth the whole Mystery of a lasting Improvement.

E c c

C H A P.

C H A P. III.

Of Planting: The best Method and Time of doing it.

BEFORE I give my Directions for planting, I would only premise these following Things, as seasonable Monitions and timely Notices to every ingenious Contriver. (1.) Let no one be over solicitous to reduce an irregular piece of Ground into any exact Squares; because Irregularities may easily be made Beauties: Strait Lines, either in Walks or Hedges, bring every thing into Shape and Order. (2.) Except where room for Fruit is much wanted, there is no necessity to be at the Charge to build high Walls; because tho' every Height can be filled and employed, yet Fruit-Trees neither want it, nor much desire it. Eight or nine Foot high is sufficient for every thing but a Pear. (3.) An exact Position or Aspect to the four Quarters, is not much to be regarded, as of consequence to the Prosperity of a Fruit-Garden. For if it be walled round (as it should) and the Walls make either obtuse or acute Angles, or both, there will be almost every Aspect, good and bad, which may be agreeably filled according to Art and Rule. Only this I would say; the more of *South-East* and *South-West*, the better; especially the former; and there is no need of being very solicitous for a full *South* Wall; because a Wall that declines either way 20° or 30° hath as many Hours of Sun, and then both Declinations are almost equally good. (4.) I cannot but add by way of Caution; that no one be over covetous to enlarge his Fruit-Garden beyond what can reasonably be well managed and carefully minded. Forty or Fifty Yards square is enough for almost any Gentleman's Fruit-Garden. The great Excesses beyond this proportion I have long observed to be one great Occasion of Barrenness. The Most are apt to cover a large Extent, but Few are willing to allow Hands enough to manage it. *

Having premised thus much, I now come to the great Business of **P L A N T I N G**. And altho' the performing this aright is of the greatest consequence to a Man's future Pleasure and Profit; yet, however it comes to pass, it hath not been well understood, and seldom rightly inculcated by those who have treated on this Subject. It is certainly a great Misfortune to set out wrong, and it is commonly thought that of all Errors a fundamental one is the worst. However, Truth, as it hates Darkeness, is plain, beautiful, and uniform; and as it loves the Light, is easily made clear and intelligible to the Understanding.

That I may then, consistent with Reason, set this Matter in its proper Light, I must here take it for granted, that the Borders both under the Walls and where the Dwarfs and Espaliers are to be placed, be made with, and *only* with the best *Virgin* or *Untried* Earth which can be got, agreeable to the foregoing Directions; not above a Foot or Foot and half deep at most; and four or five Foot wide. The raising these Borders must be discretionally done. If the Situation be low and inclining to Wet, they may be raised seven or eight Inches above the Level; if the Soil be sandy or gravelly, little or no Elevation is best.

The Borders being thus prepared for Planting, the distance of the Trees next offers itself to be considered. Here there hath been a general Failure in Practice, especially in Palisades or Espaliers; but whatever hath been the Practice, sure I am the general Rule should be four Yards distance both for Walls, Dwarfs and Espaliers; that there may be sufficient room given for *horizontal* Branches; and that the Gardener, for want of it, may not be forced to suffer the Branches to run *perpendicularly*. This then being agreed on, the whole Plan should be stak'd out in the proper distances, that when the Trees are made ready for planting, the Gardener may have nothing else to do but to *plant*.

The Fruit-Trees then being procured from some of the honestest Nursery-Men in or near *London*, (amongst whom I have long known Mr. *Parker*, and his Associate Mr. *Woodman* to be of that Character) if they have been any considerable time out of the Ground, or their Roots have been much dry'd, it is good to steep them in a Horse-pond twenty four

* *Fecundior est cula Exiguitas, quàm Magnitudo neglecta. Palladius.*

Hours, to supple and to recover the Roots: After this, Art and Care is to be used in pruning the Roots, which you must do by taking off all the small Fibres entirely, and shortning the bigger Roots to about six Inches from the Stem; and if they have received any Wound or Gall in their Carriage, that part of the Root must also be cut off. Three or four Spurs are sufficient, and therefore the rest should be quite removed; because too many large ones remaining on a transplanted Tree, are one Occasion of that gross Wood, so disagreeable both to its Bearing and Beauty; and are indeed in their Nature as ungovernable and tyrannical in a Tree, as a proud, swelling, covetous Person is in a Neighbourhood, who licks up the Fat of the Land, and tries to over-reach and starve every one that lives near him.

The Head of the Tree must also be cut off, that it may form an agreeable Figure at the bottom with *horizontal* Branches; some chuse to stay till the Spring before they do this, contenting themselves only to cut off some, and leave the rest to be shortned again afterwards. Others finish this Operation before they plant, shortning the Tree to about six Inches above the place of Inoculation or Grafting, leaving the Slope where the Knife went facing the Wall, the Root at some little distance, and the Top near touching it; contriving also, as near as may be, that two *collateral* Buds towards the Top may be left to spread Horizontally; and if any are observed to project forwards, they should be rubb'd off at their first pushing.

There is however a discretional Power to be used with respect to those Trees which are only removed from one Neighbouring Place to another, taken up with great Care and most of the Earth about the Roots: For I have frequently removed these, without either pruning Root or Branch, and that with Success; and with this design too, that I might check the luxuriant Growth of a too vigorous Tree running altogether into Wood.

The *Time* and *Manner* of Planting are next to be considered. As to the *first*, there is a pretty great Latitude in an open Winter; for in such case, that Work may be performed from the middle of *October* to the middle of *March*. But because an open Winter cannot be foreknown, I would chuse *October* and *November* for the best Season of planting Fruit-Trees, or indeed almost any Trees that are not very tender; strengthened also by these Reasons; That a Tree planted in *Autumn*, will better dispose itself for putting forth such fibrous Roots as may support the Life of the Tree, and prepare it for the kind Influences of the Sun in the *Spring*; and also remove one considerable part of the Gardeners work from the Hurry of other necessary Business in the *Spring*. However, no Time is to be lost; a few Years make a great Hole in the best Part of a Man's Life. If Autumn and the Winter Season be slipp'd thro' Indolence or Necessity, the Spring is thankfully to be embraced, as a Season for planting not to be despised.

The *Manner* of doing this deserves no small part of our Regard; because on this depends in great Measure the hopes of future Advantage. I say this; because the too common Practice hath been to bury a Tree *alive*, which of all others is the *worst*, because *most lingering* Death.

Let then the Gardener be prepared with a sufficient quantity of *untried* Earth made fine, and have a Barrow-full ready for every Tree. Let the Tree, already pruned, as before directed, in the Head and Root, be placed in its appointed Station, not digging any Hole, but with the Hand pressing it an Inch or two into the prepared Border; and after that lay on the fine Mould, discreetly filling the spaces betwixt one Root and another, till at last there appear a Semicircle round the Tree four or five Inches higher than the rest of the Border. This I call planting a Fruit-Tree.

This high planting, if it be performed with Care and future Caution, prevents that luxuriant Growth, so fatal to Peaches and Apricots especially; running them into Gum, and many other Mischiefs attending a too hasty Vigour, as will be observed hereafter. However,

To prevent Inconveniencies from hence also; after a Tree is once planted according to Art in a proper Place and with a suitable Soil, these two Things should constantly recur to the Thoughts of the Planter; *viz.* to keep it *cool* and *moist*. For it is a most certain Truth, that the hot Rays of the Sun are highly prejudicial to the Growth and Prosperity of the Tree. Its Weakness at first planting is easily overpowered by uninterrupted and unintercepted Heat, and doth almost as impatiently bear the violent Heat of the Sun, as the Optick Nerves do suffer its Meridian Rays.

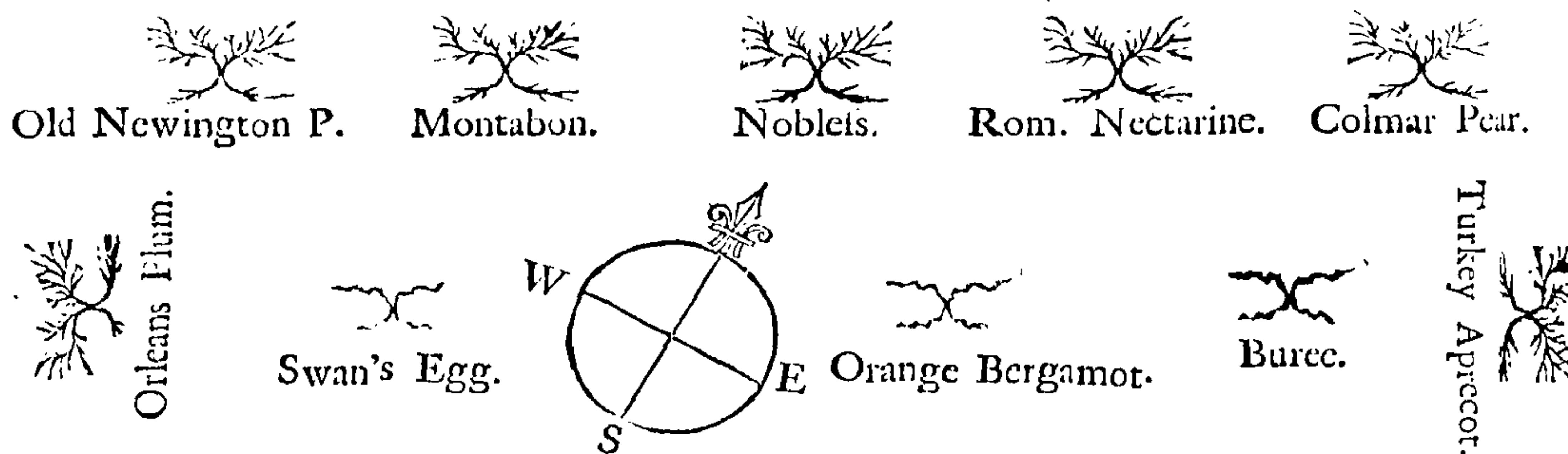
And then again, if so be the Tree was not hurt in this Particular; yet if after planting, any lasting or considerable Drought succeed, it must greatly suffer in its Health and

and Prosperity, if it do not actually languish and die. To prevent therefore these two Dangers and Inconveniencies, the following Care is strongly recommended and pressed. Soon after planting, pitch or pave the Tree round with Stones or Pebbles, in a convenient Circle, a Foot or two Diameter, discretionally judged, according to the Bigness of the Tree and the Extent of its Roots. If the Tree be Standard or Dwarf, it must be an entire Circle; but if a Fruit-Tree against a Wall, it must be only a Semicircle. When this is done, as it may be with a very little Art, so as to look not displeasing to the Eye, (the Circle being made a little concave to hold the Water) let the Tree be thoroughly well watered, and if necessity require, let it be repeated once more, in the extreme Droughts of *April*; and I have found by long Experience that a Tree rightly planted and pruned in the Head and Roots, and in right Health, cannot well miscarry. For this Method exactly and excellently answers the two before mentioned Requisites for the Growth and Prosperity of a new planted Tree; *Coolness* and *Moisture*.

N. B. I chuse not to plant a Tree in the very Coines or Angles of the Walls, having observed that such Tree seldom flourishes well for want of Air; and tho' it is to be noted, that the Fig-Tree resists this Inconvenience, and is therefore *there* best placed, because it may *there* be best defended with Mats from the Extremities of the Winter.

The Mode of the *French Espaliers* are not proper for our Climate; and therefore *Palisades* are rather to be advised, which may be formed and supported by *occasional* Uprights. The Charge of a framed Espalier is great; and if it be made (as is common) ten Foot high, before the Fruit-Trees need regularly that Support at the Top, the *whole* will be in a decaying Condition. The Palisade-Fruit-Hedges have been discontinued chiefly for want of Skill in planting the Trees, because only or chiefly their *horizontal* Branches bear Fruit: Whereas hitherto the Method of planting has been (for what Reason I cannot tell, except from Art in the Nursery-Man to force a Trade) most commonly at four, or five, or six Foot distance; whereas ten or twelve Foot asunder should be the least distance, if much more than Branches and Leaves be expected.

It may not be amiss in this place to advise a good Method of knowing and preserving the Memory of the several kinds of Fruit newly planted; and that is by a Survey or Plan of the whole, describing a plain Figure of each Tree with the Name underwritten; so as that you have alway before your Eyes even in the House, the Order, Name, and Situation of every Tree. Thus,



Before I conclude this Head about Planting, because I am so unfortunate as to differ from most others who have treated on this Subject, I think my self obliged to assign the Reasons why I directed the Borders to be made so shallow as only a Foot or Foot and half deep, and also banish all Dung as an Enemy. For (1.) From long Observation and further Experience I have found, that too great Prosperity is the most dangerous State; and tho' the other Extreme calls for a Remedy, yet that Remedy is more easily applied. Over-luxuriancy in a Fruit-Tree subjects it to *Gum* and a great deal of *false Wood*; which is an Evil hardly to be cured, except by taking up the Tree, and planting as I have directed, and sometimes by wounding and maiming some of the Roots. Whereas (2.) If there is no Failure or Fault at the Root, Superinductions and Waterings quickly cure Poverty and Weakness. But seldom or never do I find Trees complain for want of Riches, if the above-mentioned *Competency* be allowed. They *will not*, and indeed they *should not*, be proud or arrogant in their way of living, striving to over-top their Neighbours, and aiming to be great and high. Humility is more suitable to their Condition, and better answers the End of their Being: For by a gentle and gradual Progress they *soonest* attain a State of bearing Fruit, and gratefully rewarding their Benefactors; and which is more, they

they continue and remain longest in that State, bringing forth Fruit to the end of their Lives.

If tall Cherries, Plums, &c. be planted at first in the intermediate Spaces to fill the Top of the Wall; have a care they do not stand there too long; and they should be planted chiefly amongst the Wall-Pears, which are hardy and strong: Neither let the Borders be filled up or worn out with Colliflowers, and the too ordinary Trumpery of *Lavender* and *Rosemary*; the great Destroyers and Beggerers of Soil.

It will not be necessary here to mention the true Aspect every Fruit-Tree should have; because that will naturally fall under the Description of each Tree, whether Peach, Pear, or Plum. Neither need I say any thing here about *horizontal Shelters*: Their Direction will come under the Chapter of Blights. As to the first, I would only say, that a strict Regard is to be had to the true and proper Exposition, because I am sensible there has been great Disappointments attending the Ignorance or Mistake of this Point; as when some of the best *French Pears* (no way inferior to good Peaches) are thought to merit no better than *North-East* or *North-West* Walls. Or else they are planted at the very end of a *South-East* or *South-West* Wall, where they are deprived of three or four Hours of the Sun by a *Northern* Wall interposing.

In the Borders amongst the *Espaliers* or *Dwarfs* may very conveniently be set Gooseberries and Currants in the intermediate Spaces, for a time.



CHAP. IV.

Of Pruning.

THERE is nothing in the whole Mystery of Gardening that hath more employed the Thoughts or exercised the Pens of the Curious, than the Art of *Pruning*, rightly judging that wise Laws and wholesome Rules give true Life to the *Vegetable*, as well as the *Moral* World. And this Art is the more difficult, because most Trees require a *distinct* Management, and some a very *different* one.

Whether there be any thing in the Conceit of some Authors, who tell us that *Pruning* was first discovered by the Effect of the Ass's cropping the Vine, I know not: But this is certain, that the Luxuriancy and Vigour of most healthful Trees is like the extravagant Sallies of Youth, who are apt to live too fast, if not kept within due Bounds, and restrained by seasonable Corrections.

Monsieur *Quintinye* was the first that attempted to speak very particularly on this Subject; and some others both *French* and *English* have since endeavoured to explain and enlarge his Rules: But whether they have made the Art sufficiently intelligible or not, I shall not determine; but chuse rather, in my own way, and according to my earliest and latest Experience, to discover to *others* what appears to *me* to be right, and worthy of Notice; that this Work may approve itself as compleat as I intended it, and may be expected.

Now because in the Business of Pruning, it may be difficult to speak to every Case in an exact Method, without great Repetitions; to avoid which therefore I chuse (as I formerly did) to lay down some general Rules as the fix'd Laws, whereby every Pruner should govern himself, when he hath his Hammer and his Knife in his Hand ready for Discipline. Let it then be taken Notice of as an undeniable Maxim,

I. That the more the Branches, or indeed the Body, of any Tree is led or bent down horizontally, the more apt and the better disposed that Tree is to bear Fruit. So on the contrary, the more upright or perpendicular the Branches or Body are suffered to lie, the more disposed that Tree is to encrease in Wood and less in Fruit.

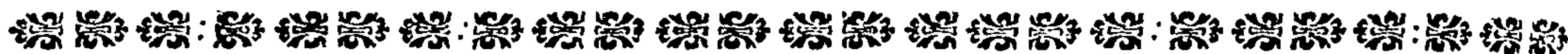
This is a known and experienced Truth: And it is sufficiently confirmed by the common Observation of such Trees as have been blown aside by the Winds; sometimes so much that half the Roots are made bare, and the Trunk lieth along very near the Ground. Such Trees as these I say are observed always to bear Fruit abundantly; altho' Nature re-directs many of the Branches to an erect and perpendicular Posture for its Increase in Wood. The Reason of this Observation seems to be: That by bending down the Branches of a Tree from a perpendicular to an horizontal Posture, you thereby check the free Circulation of the Sap; which Check, whether it be done by Art or Accident, causes less vigorous and luxuriant Shoots to be formed, and consequently more bearing Buds: Agreeable to another Maxim, *That bearing of Fruit is alway the Effect of some degree of Vigour lost.*

II. As a Consequence then of the aforesaid Maxim, it should ever be the Care, and always in the Memory of the Pruner, to keep the middle of a Tree, whether Dwarf or that against a Wall, free from *great Wood* or *thick Branches*; which, tho' they will increase and grow upon him, he is to cut entirely out, waiting for *weaker* in their Places. I always think it a defect of Skill, if a Tree be suffered long to continue without bearing Branches and Blossoms in some plenty. For tho' a Gardener cannot command Fruit from Blossoms by reason of bad and uncertain Seasons, and so cannot have it *when* he pleases; yet he may in a manner have it *where* he pleases; and keep every part of the Tree in a bearing State; but yet his greatest Skill of all is discovered when he makes the *middle part* of the Tree to bear.

III. Another general Rule is, That a Tree be not over-full or crowded with Wood, no not even with Fruit-Branches; which yet is too often seen, to the great damage of the whole. Nature cannot supply a sufficient Quantity of suitable Juices to support them, and then it followeth that none of them will be *well* supplied; but the Blossoms will either drop off, or if they set for Fruit, it will be small and insipid.

IV. One general Rule more is, To leave all strong and vigorous Shoots *longer* than the weak and feeble ones, even on the same Tree; consequently the Branches of a sickly Tree are to be pruned *shorter*, and left *fewer* in Number than those on a healthful Tree. Which Practice and Reasoning is founded on this certain Maxim, not so well observed as it ought; That all the Pruning more or less taketh not away, but gives Vigour.

But because, as I have already hinted, there is a distinct Management required for some of the best sorts of Fruit, I shall mention every Particular, that nothing material may be omitted in an Article that requires some Application.



CHAP. V.

The Vine.

Vine.] **I** Begin with the VINE, which is the King of Vegetables, and justly claims the Precedency. This is to be pruned with great Judgment and Discretion, if any valuable Reward of Fruit is expected; and yet tho' it most requires a *repeated* Skill, it is generally least understood or minded. It is *best* pruned in *November*, altho' the two following Months will answer well enough; but much later than *that*, will subject it to bleeding, which weakens the *Vine*, and hinders the Fairness of the Fruit. Contrary to most others, it bears its Fruit on the strongest Shoots. These therefore must be left, cut to five, six, seven, or eight Buds, discretionally judged, with a View to fill the Wall with one shorter and another longer; cutting the small weak Branches *entirely out*. And as the old Wood begins to grow upon you, cut every Year some of it out from towards the Bottom, that *that*, and indeed the whole Wall, if possible, may be filled *horizontally* with young Wood. Observe to let the Track of the Knife end in a Slope on that side opposite to the last Bud; and then nail it as close to the Wall as possible; not with Leather or any such stubborn Matter, but with Shreds of *Woollen*, that will stretch and yield without galling the Branches. Have a care of leaving too many even of the larger Branches: Near a Foot asunder is, generally speaking, enough; because no other Tree is so apt to fill with Wood and Leaves, and consequently to breed Confusion as the Vine.

This *First* pruning must be finished before *February*. The *Second* is to be performed in *May*, when the Clusters appear; and then the extended Shoot is to be pinched off five or six Inches above the Fruit, at the same time nailing the very Fruit, if possible, that it may touch the Wall. And forasmuch as the Vine is apt to be assaulted with many Robbers in the Body and bigger Branches, especially of an old Vine, these are carefully to be rubb'd off and check'd at their first Appearance; for nothing indeed should remain upon the Vine in Summer, but what is absolutely necessary for *Wood*, *Fruit*, and *Shelter*. And this I would repeat and lay a stress upon, to prevent the common and contrary Practice, of letting so much unnecessary Confusion remain uncorrected.

But the Vine must still be again and again disciplined. A *Third* time about *Midsummer*, when all should be re-examined; that it may be disburthened of a multitude of Branches it will have put forth, and the Rays of the Sun may be suffered *gradually* (not too much nor all at once) to salute the swelling Fruit. And so also again,

A Fourth

A *Fourth* time should the Vineyard be visited in *August*, and carefully watched, that nothing of Shade or Shelter, either natural or artificial, be wanting, and yet nothing superfluous.

The Vine requiring something a different Soil, and Culture, from other Fruits, it may be necessary to add in this Place, that the Soil and Situation of a Vine cannot well be too dry; inasmuch as it loves even the dry decay'd Rubbish of Buildings, and the refuse Lime-mortar thereof. This mixt with an equal Quantity of untried Earth is a good Border for Vines, which should not be planted nearer than six or seven Yards asunder on low Walls, that the Branches may have room to run *horizontally*.

The Vine is apt to take a Remove very unkindly; and if the Roots are much dried in the Air, it will hardly be persuaded to grow. Therefore it is good to wrap wet Moss about the Roots, as soon as taken out of the Ground; or, as Mr. *Bradley* advises upon Experience, to supple the Roots with Soap, and after planting, to give them a plentiful Watering.

There have been several Attempts of late made to accelerate the Ripening of Grapes in *England*; as putting the Fruit in or behind Glasses; to run the Branches on slope Walls or the Tiles of the House: The *first* Method is apt to make the Fruit insipid, and the *last* subjects them to the cold Nights, and perpendicular Dews and Vapours then falling upon them. The most rational and best approved Expedient yet found out, is *artificial* Fires on the *North* Side of the Wall, made hollow with several horizontal Tunnels, both under the Roots and along by the Body of the Wall, to receive and convey the Heat and Smoke; and this in the *North*, where Coals are plentiful, is no expensive Method: Or else to lay fresh Horse-Litter from the Stable on the Back of the Wall, which gives a constant, gentle, and sweating Heat, very agreeable to the Growth of Vegetables. Only it is always to be remembered, that if the Vines by any artificial Heat push before their natural time, great Care must be used to guard them from the Frosts till *April* and some Part of *May* be over.

If the desired Soil, and Situation, and Climate before mentioned were well considered and improved, I do not see but it must turn to a very good Account, in some of the *Southern* Parts, to plant a well sheltered Spot of Ground to be ordered in the Method of a Vineyard for making Wine. It is generally thought that the *South* Side of a chalky Hill is exceeding proper: But I should rather chuse an untried hot Sand or rich Gravel; because this will retain the Heat of the Sun much longer; even so as to continue warm in the Absence of the Sun, and in some measure influence the whole circumambient Air.

Vines thus planted in the way of Vineyard, *viz.* at two Foot asunder, and the collateral Rows three Foot distance running *East* and *West*, require something a different Management from those planted against a Wall: For as soon as the Hopes of Fruit are come, (which may be expected after the third Year of Planting) in *November* or *December* you are to prune all away, except one of the strongest, as a Reserve for a Standard-Plant about four or five Foot high: Only such as you find about the Bigness of an handsome Reed, *these* you are to regard and a little spare, by cutting them only to two or three Buds or Eyes next the Ground. Then apply a Prop to every one of your Vines, and tie them to the main *Standard-Shoot* before mentioned, with Oziers, about one Foot from the Earth, bending the *Top* of these *Shoots* to the next Prop, about two Foot from the Ground, that so the Ranks may stand in form of Arches, whilst the *Eyes* that you spared now in dressing shall the *May* following be bound to the Props for the next Year's bearing.

In the Beginning or Middle of *June*, when the Fruit begins to blossom, stop the second Joint above the Fruit; but remember to leave the strongest Shoot four Foot high to be the *Standard-Plant* of the Year ensuing. In the Beginning of *September*, when the Fruit begins to turn and ripen, break off such Shoots as you shall find too thick upon those you pruned in *May*, only so as to let in the Sun, and not leave the Fruit naked.

You are now to observe that the Standards which you last tied to the Props at a Foot high, and whose Tops were bent to the next, will the following Year be grown *old Wood*; which for that Reason, at the next Pruning Season is to be cut close to the Ground; and his Place is to be supply'd with that strongest Shoot which you left for that Purpose as a *Standard-Plant* four Foot high; and which you must order as before directed: Pruning all the weak Shoots to the very Earth, and leaving two Eyes to each of the stronger, as before. Be sure to remember every Winter to give the Vineyard an ordinary Digging, with a Care of sparing the Master-Roots, affording also a Coat of well prepared or else untried Earth.

Altho' I think the *black Cluster*, and the *white Muscadine* should be planted and encouraged for their early ripening; yet I think the true *Claret Grape*, which is an excellent Bearer, should have its Place in a Vineyard, by reason it affords the *most*, and *properest*, because the *roughest* Juice for making *Wine*.

C H A P.

C H A P. VI.

The Peach, Nectarine, and Apricot, &c.

I Put these three together, because their Pruning and Management is much the same; and indeed I might include all the Fruits which are usually comprehended under the Title of *Stone-Fruit*; and then Plums, Cherries and Almonds, would fall under this Head also. All which (Cherries excepted) are so nearly allied, that they make, as I may say, one Family, and admit the same Rules of Government.

But by reason there are so many Varieties of Cases to be considered, from the different sorts of Fruit, the different Soils, and the different States of Health each Tree may be in, I shall not add a great deal here to the general Rules already laid down, which I would have well considered. Stone-Fruit is very apt to put forth Plenty of bearing Wood after the second or third Year of planting, especially the Peach and Cherry, so that there cannot want Choice of good ones. These are easily discovered in *February*, by the Bigness of the swelling Buds; and that generally tempts most to defer their Pruning till then, that they may the better know what to chuse and what to refuse: Which however sometimes proves pretty difficult, when the Tree is over-vigorous, and shoots every where in great Confusion.

The biggest of the Wood, which is commonly in the Middle, must unavoidably be cut quite out, that some of the larger sort which remains may be left the longer, even to ten or twelve Inches; which if it continue increasing in Wood-Branched, must also be cut entirely out as soon as the Wall can be furnished with smaller Wood. The Fruit-Branched, if they are not over-long, may be left to their Extent untouched, provided at the same time, you have near it a Wood-Branch pruned to four or five Inches, which will supply the Vacancy in case the Fruit-Branch dies, as it often will.

Let it be the first Care in pruning these Trees, to fill the Wall at the Bottom with horizontal Wood-Branched, trusting to the middle to provide for itself: But I never chuse to bend a Branch beyond the horizontal Posture with any View of Continuance; because it seldom long outlives an Usage so contrary to Nature. All dead, sapless and yellow Wood is to be cut out, and every *Autumn* (not *Midsummer*) Shoot must be rejected as useless and unprofitable. It is very wrong and unseemly to suffer a Tree to grow out of Shape, much more extended on one Side than the other, which indeed often happens from a Decay at the Root; but this Evil is easily remedied by a Reduction, when the Tree is disengaged from the Wall, especially while it has Youth of its Side.

I add here by way of Caution. Beware of a common Fault in pruning, letting the Wood-Branched run without controul and leaving them too long in one Year. This is an Evil hardly to be remedied in Trees of some Age, because the Bark of Stone-Fruit is generally hard and tough, and will not suffer Nature to push any new Shoots thro' it. The Consequence of which is, that Trees so managed, become barren both of Wood and Fruit at the Bottom and Middle of the Tree, which hastens its Ruin; agreeable to this Maxim, *That good Pruning not only procures Fruit, but makes lasting Trees.*

Having thus, before the Leaves appear, formed your Tree into Beauty and Order, the next thing to be done (and it is commonly done with too much Reluctancy) is to thin the Peaches and Apricots, when too great Plenty appears, the latter End of *April*: For without this Care, there will be few or none fit to be eaten. After this there will be little to be done here till *Midsummer*, when there must be an especial Regard had to an Operation very seasonable and necessary: *viz.* To shorten or pinch all strong luxuriant Branches to *two Inches* of the Place from whence they shoot, with a View to get smaller and Fruit-bearing Wood in its place. This Practice is right both in Reason and Experience. Winter Pruning (as I have observed) gives Vigour to a Tree; but this Operation, when Nature is in its full Carriere, damps its Vigour, and chastiseth it into Fruit.

The same Reason holds for *plashing* a strong Branch of a Peach or Apricot, shooting directly forward; for tho' that is not to be done in Winter, yet *now* it may, and that safely; and such Branch may be so disposed, as to fill a void Place with weak and bearing Wood.

When both Peaches and Apricots begin to turn their Colour for ripening, it is very proper to pick off such Leaves as hang directly before the Fruit, that the Sun may reach them

them with his ripening Influence, and give them their inviting beautiful Colour, in perfection.

As Plums and Cherries need little Art to make them thrive and bear against a Wall, so neither do they want so much Attendance and Care as the other choicer Fruit. Altho', to make them *lasting* and *healthful* as well as *handsome* Trees, the general Rules laid down should by all means be strictly observed.



C H A P. VII.

The Pear.

THERE is no sort of Fruit which affords us greater Varieties than the *Pear*; all originally raised from the Seed, and propagated by Grafting and Inoculation. And there are some such admirable sorts of this Fruit now acquired, that not even the most *melting Peach* can exceed them in their high Flavour and richness of Taste. Inasmuch that many of them justly merit the best Place we can give them, and our highest Regard and Care in the Management of them. For which Purpose therefore, besides the general Rules already laid down, I shall offer some particular Directions necessary to be observed for the obtaining a sufficient Quantity of this delicious Fruit.

It is to be observed, that there are two sorts of Stocks generally made use of for propagating the Pear; which I mention here, because they require very different Management: The Quince, and the wild Pear-stock. The first is made use of for its early bearing: Being a Dwarf and slow Grower, the Grafts put upon it are sooner disposed to throw out bearing Wood. Accordingly it is difficult to make it spread to any tolerable Height, except in a moist and loamy Soil; and even in the most agreeable Soil, it is apt to be sickly and not long-lived. However, it is proper to have some Pears on this Stock, because you will quickly be rewarded; and some think it gives a vinous Flavour to the Fruit. The Pruning here is not difficult, because you have only weak Shoots to deal with, and those must be pruned *short*.

The free Stock or wild Pear makes the most stately, beautiful and lasting Tree; but all our Care and Diligence is called for to keep it under Discipline, and within due Bounds. And therefore no Tree more requires the strict Observation of those general Rules already laid down. It is indeed naturally too proud for a Wall: But seasonable Corrections keep all in order, which would otherwise be perfect Anarchy and Confusion.

The *horizontal* Posture of the lowermost Boughs is a sufficient Check to their Ambition; and so nothing more but nailing them to the Wall, without any Pruning, is required. But the nearer you approach to the perpendicular Posture, the more they begin to be unruly and to want Correction. But it is a Mistake to think *pruning* or shortening the Branches is a *Correction*: On the contrary, it is a real *Indulgence*, and *adds* to its Vigour: I have therefore often found it necessary to *plash* the most vigorous Shoots, cutting them near the Place from whence they shoot, more than half through *upwards*; which checks the Vigour, and forms Fruit-branches. Even sometimes a Branch projecting and which stands condemned, by such Incision is made to fill a vacant Place with good Wood.

But because the great Difficulty is to manage the very strong perpendicular Branches, that will be always pushing up in the Middle; I must add, that I make no Difficulty to cut the Bark of these quite round two Inches wide, peeling it quite off to the Wood in *May*, and then shortning the Branch, so as it may best serve the Turn wanted. By this means that great Barrenness so observable in the Middle of most Pear-Trees, will be remedied by a Fruit-bearing Branch; which if it die in four or five Years, yet will bear Fruit all that Time, and will infallibly be succeeded by many more to be used in the same manner.

Some have been discouraged in this Experiment, whilst they unadvisedly disbark the large Branches, and, it may be, the very Trunk of the Tree; which if it fail, will make either an unseemly Gap and Defect in the one Case, and may chance to destroy the Tree in the other: Whereas ordinarily, except in the way of Experiment, no Branches should be thus severely used, but such as are not above three or four Years old; and that at the proper

Time too, in *April* or *May*. To disbark them only half round (as Mr. *Carpenter* seems to advise) is doing nothing. Because a *vigorous* Pear will very quickly recover that Check and his Strength together.

In short, the Experiment and the Success of it (sometimes even on large Branches) is so well supported by repeated Instances, that if it is discreetly and seasonably practised, you may depend upon it, that not one in forty will miscarry. It may easily be perceived that this Operation as well as the former one of *Incision* or *Plashing*, is founded on a well supported Maxim: That a *convenient* and *seasonable* Check or Resistance of the Sap in its free Circulation, weakens that Part, and consequently makes it prolifick.

The *disbarking* the Pear one would naturally think should kill it; because that Operation kills I think almost all other Trees: But the Sap of the Pear, it seems, finds a Passage thro' the Pith; and such a strait one it is, as admits of only a *gentle* and *gradual* Circulation, such as ends in Weakness. *How* and in what manner it is performed, is not yet so easy to determine for want of nicer Observations and Experiments. The Doctrine of the Circulation of the Sap, I think my self and some others have undeniably proved from Facts; how it is done, I might *conjecture*; but I chuse to leave the *stronger* Knowledge thereof to *Microscopical* Observations and *Anatomical* Men.

The bearing Buds of a Pear-Tree are easily distinguished from others, even as soon as the Leaves fall; being *fuller* and more *swelled* than the rest; which is therefore carefully to be minded, that *they* may be spared in pruning. On vigorous Pear-Trees there will always be found some such as are called by some *Water-Shoots* or *false Wood*, distinguishable by the Eyes, placed at a greater Distance, and *flatter* than the rest; *these* as well as all *Autumn Shoots*, must be taken away; except Necessity require them for a vacant Place, and then they should be either *disbarked* as above, or *plashed* more than half through.

All *Wood-Branches* that project any thing forward (as many such there will be) should be cut slope-wise, to a quarter of an Inch of the Branch or Body from whence they spring; by which means their following Attempts will be weaker, and they will push only into *bearing* Wood. Above all things avoid a Confusion of Branches, and, if possible, a crossing one another in the Middle of the Tree, where the greatest Danger is. At the Extremities there is not much Difficulty; only a discreet Pruner will think it proper to leave one Branch longer, and another shorter; that the Wall may be gradually filled with weak Wood. It may be seasonable here to remark, that the *Bon Crétien* Pears of the several Sorts, especially the *Summer* one, love not the Knife at the Extremities, where they chiefly make their Attempts to reward the Owner. And because they are generally such free Growers, and so apt to run into Wood, their Vigour cannot be *too much* check'd, either in the Root or Branches; and for a contrary reason, the *Buree* Pear cannot well be too much encouraged.

I think, if what hath hitherto been said, be rightly regarded, no one can be at a loss how to govern his Dwarfs or Espaliers; the same Rules (generally speaking) taking Place *here* also: Only when *Incision* or *Plashing* is practised, a slender Support should be applied, lest the Winds break the upper Part quite off. I cannot approve of the common Practice of too much confining the Dwarfs in low Concaves: The Posture is unnatural and labour'd, and is found not to answer in the best and most difficult sorts. The open Figure and larger Extent of Branches in the *half Dwarfs*, give room to Nature to exert itself; and therefore are much to be preferred to the other for answering the desire of Plenty.

The Trees for Espaliers, being placed at the Distance of four Yards, will soon answer the Planter's Expectations on their *horizontal* Branches; provided they have their proper and occasional Supports, and the Laws before mentioned be put in Execution. The right sorts for these and for the several aspected Walls, will be mentioned in a proper Place.

C H A P. VIII.

The Fig.

OF late Years the *Fig* is come into more Repute than formerly; being found when full ripe to be not only a delicious Fruit, but extremely agreeable to the *English* Climate. It is moreover a Plant easily propagated from Suckers, which it is apt to put out plentifully at the Roots; and having the Shelter of a good Wall, it seldom or never fails of bearing a good Crop. It delights most in a mixt loamy Soil inclining to Clay, where it will push very vigorous Shoots; for on these (like the Vine) the Fruit is for the most part formed, at the Extremities; and, which is very remarkable, the very Fruit appears in *March* long before the Leaves. This Fruit is known to bear two constant Crops every Year; tho' with us in *England* it is very seldom known that the second Crop comes to Perfection: But in *France* and the more *Southern* Countries, the last, which ripens the latter End of *October*, is generally esteemed the best; and its Fruit is thought to have the higher Flavour, as having not been pinched or starved by the cold Winds in the *Spring*; for this second Fruit appears not till *June*.

There are great Varieties of this Fruit in foreign Parts, but with us not above three sorts worth planting. *viz.* The round *White* Fig, by much the best and earliest ripe: The *Violet* or blue Fig, hardy and a good Bearer. And the *Marseilles* Fig; which is high tasted, but small, and a bad Bearer. Their Management is not difficult, tho' different from most other Trees; for tho' the *French* Gardeners and their Editors have led many into Mistakes, by directing the *Pruning* and *Shortning* the vigorous Branches of this Tree, and at the same time own that *there* the Fruit must be expected; yet I insist upon it, and know it to be right from Experience, that such are not to be touched at the Spring-pruning. At the three or four last Eyes the Fruit appears.

In *March* or *April*, what is superfluous and small Wood, should be entirely removed and cut away close to the Body or Branch from whence they proceed: And so should even the large Wood that breeds Confusion. The Suckers which yearly come in Plenty from the Roots, must also be carefully pluck'd away, and the best set in Nurseries for future Use.

The Fig in the Summer doth not love too great Confinement to the Wall; but they are hardly to be preserved in the Winter without it; therefore it is advisable to plant them in some warm sheltered *Corners* of the Wall, where they may the more easily be defended with Haulm, Straw, and Mats: But then the Mice must be watch'd, lest they dis-bark the Trees. This Care will sometimes be rewarded with many of the last Crop getting safe over the Winter, and ripening the Beginning of *June*; of which I have often eaten some very delicious in the Bishop of *Salisbury's* Garden at *Sarum*.

There is this good Rule recommended in the *Retired Gardener*, which I shall here mention and enforce. *viz.* Nip off the Extremity of a young vigorous Shoot in *June*; for this will increase the Number of Summer-Shoots. It will occasion the second Crop to ripen the better; and it will probably produce more Fruit the next Year.

But the most effectual way of all others to get good and early Fruit from the Fig, is to plant them in Tubs or Boxes for Dwarfs: By which they may have the Advantage of being preserved in Winter, in Houses or any other convenient Shelter from excessive Frost. They need no watering in the Winter; but after they are set abroad in *April* in some sheltered Place, they must be well watered at first, and afterwards in the hot Weather every two Days. They must be shifted like Orange-Trees into new Cases every two Years, pruning their Roots, and giving them fresh, rich and loamy Earth; and by this means you cannot fail of good Figs the greatest Part of the Summer. Some have recommended the setting a Fig-Tree at the Bottom of a pretty deep Pit, not excluding any Part of the Summer-Sun, and yet every way defending it from the Severities of Wind and Frost: Which with the help of good Soil and artificial Shelters may rationally be supposed to answer.

Some other Fruit-Trees improved by pruning, and used as Dwarfs or Wall-Fruit, are as follow.

C H A P. IX.

The L'Azzarole.

THIS is a Fruit little known amongst us, till of late Years. It is of the *Medlar* or *Service* Kind, and produceth a very pleasant Fruit, in bigness betwixt the *Medlar* and *Service*. It is propagated like those, either by grafting or budding on the White-Thorn or Quicken-Tree, and is therefore now to be had with most Nursery-Men about *London*.

It will grow and bear very well on Dwarfs, resisting even the hardest Winters; but it is much improved by a Wall, especially if governed by the general Rules already laid down.



C H A P. X.

The Mulberry.

WE have two sorts of this Fruit, the *Black* and the *White*. The *first*, except in some particular Soils, is a very slow Grower; but bears a most delicious Fruit; tho' it is so very tender when it is full ripe, that it will hardly bear carrying without much Injury and Bruising. The *White* bears but a very indifferent insipid Fruit, and would hardly be worth planting, but that it is a free Grower, and affords plenty of Leaves for the industrious *Silk-Worm*. And (as the ingenious Mr. *Bradley* observes) the black sort seldom growing strait, it would be proper to inoculate the *Black* upon the *White* Stock, which would quickly make it an handsome Tree.

This Tree bears *Catkins* with Male and Female Blossoms at the same time. It is observed to be, of all other Trees, the *wisest*, never pushing its Shoots till the Frosts are all over. And by the first Appearance of its Leaves, some govern themselves in the Remove of their Orange-Trees out of the Conservatory; which is by much a better Rule than the superstitious One, of the Increase of the Moon. It is increased either by the Seed sown in *March*, or by Layers and Suckers; and sometimes even by Cuttings prick'd in fine Earth, and a shady Place in *April*. It is great pity this profitable Tree is not more encouraged in *England*, where it is generally thought we might have as good Silk made from the Leaves as any that is brought from *Italy*. For there the *Silk-Worms* are subject to many hazards, and are often spoiled by the violent Thunders frequent in those Parts, where they are never sure of a profitable Increase till the Worms have actually spun their Silk. But I am told there are great Plantations of these Trees already made, with a View of beginning and carrying on the Trade in earnest; which doubtless will prove the Advancement and Support of many Families, as well as a general Profit to our Native Country.

The Fruit of this Tree ripening late, and some Years not at all, hath tempted many to set them against a Wall; and doubtless if the Tree were managed by Rule, as all Timber-Trees should, we might receive its Fruit much *earlier* and *larger*; but I am afraid not *better*: For, as far as my Observation hath gone, I find all Fruit, without Exception, which will bear and ripen on Dwarfs or Standards, are much better and higher tasted *So*, than from those against a Wall. The Wall almost always makes Fruit *larger*; but the want of free Air takes something from their Flavour.

Some say the Timber of this Tree is as durable as Oak under Water; and the Bark of it makes good Ball-Ropes. Moreover it is observable, that it will suffer no Caterpillar or Vermin to breed on it, either standing or fallen, save only the *Silk-Worm*.

C H A P. XI.

The Apple.

THE *Apple* is so well known, being planted almost in every Farmer's Orchard, that were it not for its use in *Espaliers*, I might have been excused saying much of it in this Place. There is no Tree that affords more Fruit in the way of Hedges than the Apple; and yet (because it is not rightly understood) appears generally less fruitful. For what with the Fault in planting, and the Defects in pruning, you find little else but confused Branches of Wood and Leaves: Indeed every sort of Apple is not proper, and will not so well suffer Confinement. The *Codlin*, the *Non Parelle*, the *Kirton-Pippin*, the *Holland-Pippin*, and *Golden-Pippin*, are those I would chuse for *Espaliers*; and if these be planted four Yards asunder, as they ought, and pruned to all the Rules before laid for Pears, (except that one of disbarking all round, which to the Apple is death) there can be no danger of plenty of fair Fruit: And the same Reasoning and Rules hold for Dwarfs.

When I first came into the Bishoprick of *Durham*, I was a little surprized to see almost every where Apple-Trees planted against the Walls; and it gave a melancholly Turn to my Thoughts, as if hardly any thing better would grow there. Only I was soon set right again, when I came to eat some of the finest and latest Peaches and Pears planted by strong Resolutions and *modern* Courage. But indeed the Practice of setting Apple-Trees against the Walls, might be rationally enough grounded, if they were confined to the *North*, *North-East*, or *North-West* Walls, where they do singularly well, and answer their end. Because tho' the Winds are not colder, yet they come with a greater and more uninterrupted Violence than in the mid-land Parts, by reason of a manifest defect of Wood cut down of late Years, and from the narrowness of the Neck of Land between the *Western* and *Eastern-Sea*, from *Carlisle* to *Newcastle*. Except therefore the case of a naturally good Shelter and Situation, the Apples in exposed Orchards are generally blown down before they are half ripe; and this frequently tempted the Inhabitants to lay hold of the Shelter of a Wall for their Apples: And for want of Knowledge and Experience, they carried the Practice so far as to plant even their *South* Walls with Apples and baking Pears; which are now found to produce some of the richest Peaches, Pears, and *Aprecots*.

Some of the aforementioned Apples then being supposed to be rightly planted against *North* Walls, amongst the *Morella-Cherries* and early Plums, an ingenious Pruner will always contrive to suppress their luxuriant Growth, and give room both to these, and the *Espaliers*, to spread in *horizontal* Branches. However, Experience teaches, that most Kernel-Fruit, suffer by too free pruning; and by the unskilful Management of the Knife, they are observed sometimes to canker and die. It is therefore more adviseable, where Necessity requires Amputation, to *break off* the Buds, which would produce strong Branches, when they *first* appear; rather than leave them to be cut from the Tree in Winter. It is easy to discern in the Spring what Buds will be proper to fill vacant Places, and to know such weak ones as are most likely to answer for Fruit; and this time of *chusing* and *refusing* in *May*, will prevent a great deal of future Trouble and Inconvenience: Especially if any of the strong Shoots which are left, be pinch'd off at *Midsummer*, near the Place from whence they push, which will throw them into bearing Wood.

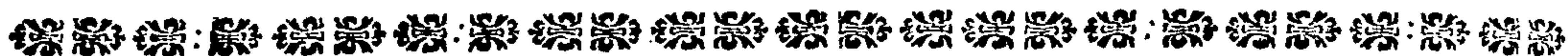
Midsummer is the proper Season to tie the Shoots to the *Espalier*, and to disburthen the Tree (especially if it be weak) of its superfluous Shoots. And let not the Branches crowd too near one another, that the Fruit may attain its proper Largeness and Beauty.

Most sorts of Apples will bear well upon *Half-Dwarfs*, with little Trouble or Care, especially if grafted upon the *English* Codlin: But every one, who hath seen the Beauty and Fruitfulness of those grafted upon *Paradise-Stocks*, will allow that there is nothing either in the Flower or Fruit-Garden, that can vie with it for its uncommon and pretty Qualities. The *Paradise-Stock*, so called by the *French*, is properly a *French* Codlin, much more naturally a Dwarf than the *English* one, and consequently what sort soever is put upon it, is more a Dwarf too.

It is about thirty Years since it was first brought over into *England*, and the Plants were then sold at Five Shillings a-piece: But now, because it is pretty easily propagated from Suckers and Cuttings, they are become not much dearer than our *English* Dwarfs.

They have of late been much encouraged, and deservedly admired; because as they take up little more room than many Flowers, so they are readily admitted into the Parterres, where they attract the Eyes of their Admirers; whilst they behold them overspread with Blossoms in the Spring, and laden with inviting Fruit in Autumn.

A great part of their Beauty consisting in their dwarfish Stature, they should not properly be suffered to grow in their extended Branches above ten or twelve Inches high; and then some of their Fruit may often conveniently be laid upon Tiles like Melons on the Ground. Some think it adds to their Beauty and Prettiness to set them in Pots; where, if they are carefully watered they will grow and bear well; especially the *Non Pareille*. A dozen of which upon one Tree would agreeably surprize the Company at the end of an Entertainment, standing on the Table.

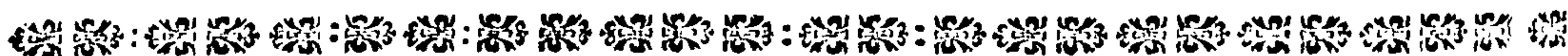


C H A P. XII.

The Medlar and Quince.

THE Medlar is of two sorts. One much larger than the other; the largest is best and least gritty. It delights in a loamy Soil, inclining to Clay, and is propagated by grafting on the *Quicken-Tree* or *White-Thorn*. It bears and answers best, managed as an Half-Dwarf; but it is to be observed that its Fruit, contrary to all others, is not properly ripe till it is *rotten* or decayed; and then it is very agreeable to many Palates.

The Quince is one of the *natural* Fruits, which requires no grafting; for it is raised from Layers, Cuttings and Suckers. There are chiefly two sorts of it, distinguished by the *Apple* and the *Pear* Quince; the last is the fairest and best Fruit, especially those brought originally from *Portugal*. There is hardly any Soil wherein they will not grow, tho' it has been generally thought, that they love *only* a moist one. It is a free Bearer, and most useful Fruit baked or boiled; but by no means to be eaten raw, either with Pleasure or Safety. The Fruit is often too heavy for its tender Branches, and is therefore apt to be bruised or blown down from Standards. I have known it much improved in Largeness and Beauty set against an *East* or *West* Wall. But the Physicians will not allow it to be eaten in any quantities without great Correctives: Which is their Rule for the *Medlar* also.



C H A P. XIII.

Of Grafting.

BEFORE I proceed any further in the Management of the *Fruit-Garden*, I shall distinctly treat of and direct the several Mechanical Operations, whereby the several sorts of Fruits, and their great Varieties, are propagated and increased. And indeed without the Benefit thereof, the Business of the *Fruit-Garden* would be almost at a stand, or at least confined within a very narrow Compass. Because it is seldom that we can get the same Fruit from setting the Stones of *Peaches*, *Apricots*, and *Plums*; Nature that way being so apt to degenerate; and seldomer still from sowing the Kernels of *Pears* and *Apples*.

This Difficulty originally and from the beginning put the *Curious* upon contriving how to *incorporate* a Branch into a Stock of the same Species, and by a sort of *Marriage* to make *Two* to become *One* Tree. And this hath been contrived several ways, according as the

the different Fruits will admit; all of them well answering the design of a *perfect Union*; and if the Philosophy of it is not so well understood, yet it is plain from Experience, that the Nature of the Fruit always follows the Nature of the Cyon, Graft, or Bud, and partakes little or nothing of the Nature of the Stock, which only gives Nourishment and sends up proper Juices to support a *Super-plant*: And if a Stock be grafted successively with ten sorts of Apples or Pears, one upon another; yet the last grafted obtains the Privilege of bearing its own Fruit, although the Sap is convey'd through the Ducts and Vessels of so many different Kinds.

The first Contrivance of making this *Union* is by *Grafting*; which is performed, and that with Success, several ways. The first and most common way is by *slitting* the Stock after the Head is cut off, which is called *Slit-grafting*. After the Head is cut off slope-wise, and made horizontally even at the top, chuse a smooth Place on the *West* side, if possible, of the Stock, and there make a Slit two or three Inches down the middle with a strong Knife or otherwise. After which, prepare the *Cyon* taken from a vigorous Shoot of the foregoing Year, and if it have part of the preceeding Year it is never the worse; with a sharp Knife *slope* it on each side from a Bud or Eye, so that by a taper Shape like a Wedge, it may conform itself to the Slit in the Stock, and the Bark of both Stock and Cyon may exactly close. The Cyon should not be above four or five Inches long, that after the Clay tempered with Horse-dung is put round about it, it may appear only with two or three Buds or Eyes; for if it was much longer, the Birds resting upon it would be apt to disturb it.

Another way is called *Whip-grafting*, practised where the Cyon and the Stock are pretty near of a Bigness: In this way both the Cyon and the Stock are cut with a Slope, and near the end of each Slope both are also slit, so that they may be thrust down one into the other as with a *Tongue*, still ordering it so, that the Cyon and Stock may exactly conform on the outside, and the end of one Slope may just reach the beginning of the other. In this way (and sometimes in the other also) there will be a necessity to use Wollen Yarn to tie them, and preserve the *Union*: And I chuse Yarn rather than Bals-Mat, because it *yields* before it will gall, upon the swelling of the Stock.

These two Ways are usually practised upon Stocks for Pears, Plums, Cherries, Apples, and Hollies. But there is still a third Way much more suitable to the Nature of the two last; and that is, to cut off the Head of the Stock slope-wise as before, and instead of *slitting* the Stock, slit only the Bark a little above an Inch on the back-side of the Slope. After which the Cyon is to be cut with a flat Slope about an Inch long, beginning the Slope from the backside of an Eye: Then raise the Bark of the Stock where the Slit was made, with a smooth piece of Ivory or Wood, made slope-wise as the Cyon, and thrust it down betwixt the Wood and the Bark, that the Cyon itself may readily enter, the beginning of the Slope remaining with a little Shoulder on the top-surface of the Stock. It must be clay'd over as before, and as many Eyes left.

The two first Operations may be performed on Pears, Cherries, and Plums, the latter end of *February* and in *March*; but in the last Way, Hollies and Apples must not be grafted till *April*, when the Sap more freely moves, and the Bark will readily part from the Wood.

There is still another Method mentioned by old Authors on Gardening, called *Grafting by Approach*, as a Way of more Curiosity than real Use, and hath hitherto been generally confined to Apples, Pears, Plums, and Cherries; still taking it for granted, that Peaches and Apricots can be increased no other way but by *Inoculation*; the Method whereof I shall presently describe.

Now altho' *Inoculation* is so well understood and practised, as to answer the Purpose of the Nursery-Men, except in very dry Years; yet because that Method doth not *always* answer, and because it is very desirable to know *all* that Nature will do for us, I shall consent to the Request of my *ingenious*, tho' *unknown* Correspondent, Mr. G. Talbot, at *Louvain*, and communicate to the Publick all that passed between us on this Subject of grafting even Peaches, &c. by *Approach*. And I do it the rather, because in the familiar way of expressing one's Mind by Letter, there are many accidental Hints let fall, which are not only more instructive and diverting, but leave a more *abiding* Impression upon the Mind. His first kind Letter is as followeth.

Most Honoured and Reverend SIR,

“ HAVING had some Years ago the good Fortune to meet with your *Clergyman's*
 “ *Recreation*, &c. I was as much delighted and pleased with it as those who made
 “ you the most early Compliments upon it. Accidentally since, changing my Climate,
 “ I've made a Remark or two, I flatter my self, may be added to your two Essays, and
 “ even contribute to the *Gentleman's Recreation*. Not, Sir, that I am so vain as to think
 “ I can instruct you in that noble Art, or (if the School-Men allow it) *Science*: But ha-
 “ ving Obligations to you for your two Treatises of Gardening, I thought I could neither
 “ better make my Acknowledgments, nor better pay you suitable Returns of *Pleasure* and
 “ *Profit*, than by putting a foreign (if not my own) Experiment into your hands; which
 “ not only Reason but Experience too assures me, will with a kind of *ad hoc* be an Im-
 “ provement to the *English* Nursery-Man, whether Clergy, Gentlemen, or others. Tho'
 “ Grafting and Inoculating are the *common*, if not the *only* Ways in *England* of raising
 “ good Wall-Fruit Trees; yet in *these* Countries, we now begin to have a *third*, more
 “ expeditious and infallible by far than either of the aforementioned, which I term *Nur-*
 “ *sing* or *Suckling* young Trees. The Method, Sir, is this. At the Time of transplanting,
 “ we take out of our Nurseries such Stocks as we have a mind to improve, and plant
 “ them discreetly *by* or *under* such Trees as 'tis proper they should have a more generous
 “ Alliance with. When the respective Grafting-Time is come, a correspondent Scyon's
 “ to be taken, and (without cutting it off from the aforementioned Tree) only gently
 “ and cautiously with a sharp Penknife, cut off a little of the *Bark on each side*, where it
 “ is to be fixed in the Stock, by way of *Slit-grafting*; and that it may remain *in Statu*
 “ *quo*, I bind them together with a Line, and glaze it over with Bees Wax to keep out
 “ the Air. A prudential Number of Eyes may be left above, one, two, three, or four,
 “ in proportion to the Vigour of the Tree and Stock; both which collectively nurse the
 “ Scyon. And you know, Sir, 'tis said two to one are Odds at Foot-ball. I need not
 “ by way of Proof assure you I have now several Trees in a flourishing Condition, raised
 “ this way: I am sure the Insight you have into vegetive Nature and new Philosophy (or
 “ as some term it *Cartesianism*) will convince you before you try it, the Experiment will
 “ succeed. Hence, in Gratitude for your Zeal for the publick Good, and Improvement in
 “ Gardening, I make you a Present of it. And the Love I bear my Country-Men makes
 “ me desire you to give them the Experiment in Print, whether in your own Name or
 “ mine, 'tis equal; provided the Publick be advantaged by it, I've got all I desire, next
 “ to pleasuring good Mr. *Laurence*. We remember in *Autumn* to cut the leading Fibre
 “ slope-wise correspondently to the Stock below the *Union*; after which it may be tran-
 “ splanted either for Standard or Dwarf at pleasure. *Voici, Monsieur, un Coup d'Essai bien*
 “ *rare!* Secondly, Sir, I'm given to understand, one may raise very good Peaches, Necta-
 “ rines, and Aprecots, from Stones only; but they are not long-liv'd, and the Stones
 “ should come out of a much hotter Climate. This I advance from credible Information.
 “ However, that I may have a *Physical* and not a *Moral* Demonstration only of it, I've
 “ now actually sent to *Rome* for several Fruit-Stones, which I expect will arrive here in
 “ *Autumn*. The Soil I am blessed with here, I assure you, Sir, is so rich, that last Sum-
 “ mer I had a *Magnum bonum* Inoculation made one single Shoot of four of these Country
 “ Ells, which are (you know) three *English* Yards. This I mention, not as material, but
 “ only because I do not remember ever to have seen in *England* a first Year's Shoot above
 “ half so long. I hope, Sir, my first Experiment will make an Apology for this Liberty;
 “ and should your Goodness be so extensive as to honour me with an Answer, you may
 “ direct to me at *Louvain, Brabant*; which would be a singular Pleasure to,

S I R,

Your most obedient Servant,

G. TALBOT

Mr.

MR. LAURENCE'S ANSWER.

Worthy SIR,

“ YOUR most kind, obliging, and ingenious Letter, I received. I am very well satisfied the Study of Vegetable Nature has been very much neglected; and altho’ I broke the Ice, and have given several short Rules and Hints for Practice, founded upon Reason as well as Experience, am sensible that it is yet capable of great Improvements, both for the Pleasure and Profit of Mankind. I am therefore not surpris’d to hear from all Quarters, that ingenious Persons are much bending their Thoughts that way: And it is in particular with an agreeable Delight, that I read the *Nostrum* you have been pleas’d to communicate to me; and the rather, because I plainly discern you have entirely disengaged your self from that *Narrowness of Soul*, which is the Bane and Hindrance of all noble Enquiries into Truth, and is too often an Appendage to Men of a Profession, who chuse to go on in a *beaten*, because they think they cannot go in a better and *safer* Path.

“ What a fatal Stop such a Principle would have made to all the late noble Improvements in Astronomy and Philosophy of all sorts, I need not say to a Man of your Ingenuity and Candour. But altho’ the universal kind Reception my Books have met with, shew that Men of Letters and Sense will not be ty’d down to Forms; yet how angry are the Herd of the Mechanical Gardeners, that a Clergyman should say or do any thing to please their Masters? Whereas Blessings and useful Discoveries are not always convey’d in what are commonly thought the proper Channels. It should be remember’d, that the Art of *Gunpowder* was invented by a learned Ecclesiastick, and the Art of *Printing* found out by a Military Mechanick. If any thing useful is found out, it matters not from what Quarter it comes. Tho’ I own I was agreeably surpris’d with your frank and ingenious Acknowledgments, and the Testimony of your Love, accompanied with such useful Experiments; to which I only say here, *Macte virtute tua*.

“ The Method of propagating Fruit-Trees in that way you have described is pretty; and, if I understand you right, may be of use to the Nursery-Men on the account of greater Expedition: But you are aware, that grafting by *Approach* (which is the same which you call *Nursing* or *Suckling* young Trees) has been an antient Practice, and is mentioned by *Langford* and others, as of more Curiosity than real Use. Only I cannot find that it hath been ever practis’d on any other Trees but *Standard-Fruit*, viz. Pears, Apples, and Plums: Whereas you have brought the Method, it seems, to bear (if I take you right) on Wall-Fruit Trees, Peaches, Nectarines, and Apricots. If so, and that it can be practis’d *ordinarily* in the Nursery, without crowding the Borders in the Fruit-Garden, with proper Stocks, the Use and Advantage will be considerable. But then I much doubt, whether in our Climate such a Practice would succeed in the open Nursery, expos’d to Winds and Cold.

“ When you favour me with another Letter, please to explain your self on this Head, and whether you begin this Practice in *March* or *April*; and whether also it will do on Stocks newly removed; for you know *that* is not ordinarily to be practis’d with Success: But what two to one may do, I can’t tell. As to what you have been told about good Peaches rais’d from Stones, it is assuredly very right: For all the Variety of good Peaches we have, have been rais’d that way; and I very well know further, that no one sort of Fruit is more like to answer our Expectation of having the same Fruit from the Stone than the Peach. But yet neither is this to be depended on: And when the Failure of having a worse sort happens, I need not say how great the Disappointment is to them who trust to a good one in their Fruit-Garden. I have already observ’d in my Books, that Nature for the most part degenerates. The Seeds of Apples, Pears, Nuts of all sorts, and best Cherries, very rarely prove the sorts you sow them; and tho’ they are generally and for the most part much worse, yet sometimes indeed they prove better. This ought to be taken notice of by those who think they are nursing up a Treasure, when they have sowed the Seeds of what they fancy. But neither should this discourage any one from trying to *improve* Nature; because *improved* it certainly may be.

“ I much approve of your Thought of sending for Peach-Stones from *Rome*, and heartily wish you could spare me two or three of them to make Experiments here. I have several things to communicate to the Publick, and when my Leisure will give me leave to dispose them, I will answer your Desire in publishing your *Nostrum*. In the

“ mean time I cannot but admire the Riches of your Soil and Climate, that hath afforded
 “ you so uncommon a Shoot from Inoculation. But I need not say to you, if such an
 “ one was intended for a Dwarf, the best way had been to *pinch* it off to about two
 “ Inches the latter end of *May*, that it might form *more* and *weaker* Shoots.

“ You may perceive by this long Letter, that I am got upon a Subject I know not
 “ how to leave: But because the Letter is to travel a good Way, I was not willing it
 “ should go empty: And yet it would not be compleat, nor should I acquit my self
 “ *a la Cavaliere*, if I should not sum up the Whole with Thanks for the friendly Com-
 “ munication of Your's; assuring you that I am,

S I R,

Your much obliged Friend,

and humble Servant,

J. LAURENCE.

M. T.'s Second Letter.

S I R,

“ F E W Letters have been more agreeable to me than your's, *August 4. 1721*. As
 “ far as I know of the Art of Gardening, it consists more in Practice than Specula-
 “ tion; and therefore we Mechanical Gardeners must not be expected to remove Ob-
 “ jections: Yet what little Glimmerings I have of Reason, I am willing to bend that
 “ way, in order to pleasure good Mr. L——As far as I succeed, he'll applaud me; where
 “ I come short, his Goodness will excuse me, and accept of the Will for the Deed. Be
 “ assured, Sir, I have neither read *Langford* nor others about what I writ; their saying
 “ Grafting by Approach is of more Curiosity than of real Use, may stifle all further En-
 “ quiry among those, who limit their Practice to *Langford's* Words. But if Experience
 “ proves the contrary, he's cast; if not, I am. If Apples, Pears, and Plums, can be
 “ raised this way, Wall-Fruit can too, for the same Reasons, and by the same Expedi-
 “ ents. Peaches, Nectarines, and Apricots, I have thus raised. The chief hazard I have
 “ found, is in tying 'em too fast, which I presume stop't the Sap's rising freely, so weak-
 “ ened the Shoots; but did not prevent growth. Hence perhaps tempered Clay may be
 “ properer than Flax, where the Scyon is weak, and the Stock strong enough to hold it
 “ in the fixt Posture. Where Flowers are preferred to Trees, 'tis reasonable they should
 “ enjoy the Royalty; where Trees are preferred to Flowers, why may not they have the
 “ same Privilege? Crouding of Borders, 'tis true, is a great Eye-sore, if not false Heraldry:
 “ And two Bodies, if we believe good Authors, cannot be in the same Place at the same
 “ Time; yet under a large Apricot-Tree we can have *Tulips*, *Gilly-flowers* or *Pinks*, tho'
 “ the Stem of it runs into the middle of the Border; cannot then, from a stronger Ar-
 “ gument, a young Stock, which is to be removed again in *Autumn*, be set close to the
 “ Wall behind the Pinks? I've found this true from my own Practice. No Body doubts
 “ but Grafting and Inoculation will succeed in open Nurseries exposed to Winds and Cold.
 “ Experience proves those Operations can abundantly be defended from the Weather.
 “ Whatever Precautions any Nursery-Man takes in this, the same he may if he pleases in
 “ my case, and with more success; for too to one are odds. I need not inform you when
 “ to begin this Practice; you know an open Winter accelerates the Spring, and long and
 “ hard Frosts retard it. Yet this is certain, that Wall-Fruit should sooner be grafted by
 “ *Approach* than Apples. Doubtless, Stocks removed in *Autumn* are better disposed for
 “ growing, than in the *Spring*; yet I've try'd both with Success. Upon the whole, I do
 “ not in the least doubt, but when you try my Method of *Grafting* Peaches, &c. it will
 “ succeed. I've remarked, that even when the *Stock* is dead, the Scyon will make an
 “ handsome Shoot, being nourished only from its Mother-Tree. 'Tis true, this is to no
 “ Effect; yet even from such a Failure, I think one might frame a strong Argument in
 “ Confirmation of what I have advanced: But I need none such; since successful Expe-
 “ rience has put the thing out of doubt at *Louvain*.

“ I must beg you'll excuse Haste and all Faults, in which you'll highly oblige,

S I R,

Your very humble Servant,

G. TALBOT.

The Answer.

Worthy SIR,

“ I Am extremely obliged to you for your last kind Letter, which came safe to my
 “ hands. You rightly observe, that the Art of Gardening consists more in *Practice*
 “ than *Speculation*; and therefore if the Mechanical Men would but be persuaded to leave
 “ sometimes the *beaten Road* to make Experiments, we might expect great Improvements
 “ in that Science. However, Reason and Speculation are the great Incitements for *Prac-*
 “ *tical Knowledge*. As therefore Practice cannot well be separated from Speculation, so
 “ Speculation alone should never make any appearance in the World till it is confirmed
 “ by Practice: Inasmuch as I could give you several Instances of Things certainly true in
 “ *Theory*, which are false in *Practice*. But when Speculation and Practice are discreetly
 “ joined, they make a noble and useful System in any Science. I have my self done some-
 “ thing in this Way, and I believe have put Men of greater Leisure and Ingenuity up-
 “ on the Study of Vegetable Nature, in order to make Experiments.

“ Would my Business give me Leave, and had I but Elbow-room, I have a great In-
 “ clination to turn *Quack* in Vegetables, and to say something about the Nature and Cure
 “ of Diseases amongst Trees; concerning which I have made Observations for several
 “ Years: Some of which Diseases, analogous to those in humane Bodies, I find to be *cu-*
 “ *rable*, and others *incurable*. There is also plainly a further Analogy even in the Nature
 “ of their Distempers; for some Fruit-Trees are subject to the *Dead Palsy*; some to the
 “ *Yellow Jaundice*; some to the *Measles*; others to the *Diabetes*; and not a few to the
 “ *Consumption*. But whither am I running in a Letter——?

“ I doubt not at all of the Success you have had in your way of grafting Peaches, &c.
 “ by way of *Approach* or *Inarching*, which I have since heard has been introduced in many
 “ Places: And if it was supposed not to be better or more expeditious than the common
 “ Practice; yet I think we ought to know all that Nature *will* or *can* do for us.

“ You are exceeding kind in sparing me some of your Peach-Stones from *Rome*; and
 “ therefore I cannot conclude, without repeating my Thanks to you, for your kind and
 “ generous Communications and Presents. I wish it lay in my Power to make you any
 “ suitable Return. In the mean time I desire you to believe that I am,

Sarum, Nov. 9. 1721.

Your much engaged humble Servant,

J. LAURENCE.

Since the Receipt of these Letters, I have been informed that of late several have pra-
 ctised this Method in *England* with Success, and so 'tis probable 'twill now soon become
 familiar. And as there are some *Seasons* and some *Cases* pretty difficult in the ordinary
 way of Inoculation, this of Grafting by *Approach* will be found to be very useful and ad-
 vantageous. To say nothing of the Difficulty of Inoculating in dry Summers, some Peaches
 are very hardly brought to an Union with the Stock; as particularly that incomparable
 Peach newly raised, called the *Royal George*, which will not be persuaded to incorporate
 with any of the common Plums, Peach or Almond Stocks; but in this way of grafting by
Approach in the Spring, there should seem to be no Difficulty. However, I have been
 told that in the way I have *formerly* * recommended of putting an *Aprecot* on the *Muscle*
 Plumb, and then by inoculating this Peach upon the *Aprecot*, it will readily take. One
 way or other 'tis to be hoped it will be made *familiar* to every *rebellious* and *stubborn* Na-
 ture.

* *Gent Recreat.* p. 96.

C H A P. XIV.

Of Inoculation.

THIS is a pretty practical Amusement in Gardening, invented to assist Nature in her generous Inclinations to afford Mankind every thing pleasant and profitable, for where Grafting fails and will not take place, this of *Inoculation* amply supplies the Defect: And is performed also in such Summer-Seasons as makes it entertaining, safe, and pleasant; and for that Reason is preferred to the former, which too often subjects the Operator to cold Weather, wet Feet and dirty Hands.

The Method of performing it is this: Cut off a Summer's Shoot from a Tree you cover, any time a Month *before* or a Month *after* Midsummer; not *in* a wet, but *after* a wet Season is best. Then chuse a smooth Place in your Stock (which should not be above four or five Years Growth) making a perpendicular Slit in the Bark, something above an Inch long, and another cross-wise at the Bottom of that, in the Form of an inverted **J**; then with a Knife roundish at the Point, and keeping one Hand steady, with the other gently loosen the Bark of the Wood on both Sides, beginning at the Bottom; but be very careful not to raze any Part of the Wood, for that would spoil all. Your Fruit-Branch being ready at hand, from some of the middle Part of it, cut off with a sharp Penknife one of the Buds or Eyes a little more than an Inch long, entring with the Knife something into the Wood of the Branch, as much *above* as *below* the Eye. After the Bud is thus cut out, immediately with the Point of the Penknife and your Thumb take out the *woody* Part of the Bud, and if in doing that you discern the very Eye of the Bud come away (as sometimes it will) reject that, and try another instantly. Then slip this Bud in between the Bark and the Wood of the Stock at the Cross-slit already opened, leading it up by the Stalk where the Leaf grew, till it falls in at the Bottom and so exactly closes.

This done, bind it about with coarse woollen Yarn, that all the Parts of it may close exactly, and the Bud incorporate itself with the Stock, as it will do in about three Weeks time; and then you must loosen the Yarn, that it may not gall the Place too much.

This Operation is best and safest, when performed in cloudy Weather, or at least in an Evening, that it may get a little Strength before the Return of the Sun. But observe the quicker it is done, the better the Work will succeed. After a little Practice, it will soon become so familiar, that many Inoculations may be done in an Hour. However it is adviseable to put two or three Buds into one Stock, not just one over another, that in case of Accident, you may be the surer of one to succeed. If you begin this Work early and the Bud fails, you may make a second Attempt the same Year. For sometimes, when a Change of Fruit against a Wall is wanted, a Disappointment *there* is very undesirable; and therefore the sooner the End is attained the better.

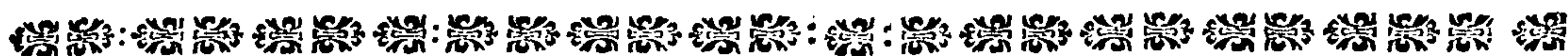
Peaches, Nectarines, and Apricots, are not to be raised, and admit of no Union with the Plum or Almond, but by Inoculation, (except in the Case of grafting by *Approach* as above) and yet I think no Fruit refuseth this Operation. The Apple, by reason the Bark doth not ordinarily well part from the Wood, doth not readily submit; but yet I have frequently propagated Apples this way, if the Attempt were made upon young Wood. The Cherry, Plum, and Pear, almost never fail to answer in Budding: Whereas very often the Coldness of the Spring destroys the *Grafts*, even sometimes after they are put forth.

Any time between the Beginning of *June* and the latter End of *August* most Fruit may be inoculated, and sometimes Pears even in *September*. But it must be taken notice of, that the Branch or Shoot taken from a Fruit-Tree to inoculate with, must not (as in the Case of Grafting it may) *lie by* any time; but should be presently made use of, as above.

All the variegated Hollies, that make so beautiful a Figure in the Parterre are best propagated by Inoculation; and so are the strip'd Philereas and Jessamines, as well as Oranges and Lemons. And now I mention the Jessamine, I cannot forbear repeating what I have already communicated to the World, *viz.* The noble and certain Demonstration of the Circulation of the Sap, by inoculating the yellow strip'd Jessamine on the plain one; whereby not only that Branch, but the whole Tree becomes ting'd and variegated, as the Sap in its Passage down to the Roots and up again to the Branches gradually *dies*, and as

it were *poisons* the Wood and Leaves. About three Weeks or a Month after Inoculation, when you come to unbind, you may quickly discern which are good and have *taken*, and which not; for the Good will appear verdant and well coloured, and the other dead and withered. In *March* following, you must cut off the Stock three Fingers above the Bud; otherwise it will make none, or a very weak Shoot. The next Year it is to be cut close, that the Bud may cover the Stock, as Grafts do.

Methinks I should not need to add, that Discretion must guide the Operator; when he inoculates. For Dwarfs must be budded very near the Ground, that they may answer their end when they come to be removed out of the Nursery; whereas Standards should be chosen from the straightest Stocks, and budded five or six Foot high. *N. B.* Inoculating some of the smaller and more distant *Roots* of Plums, Pears, &c. hath been practised with Success.



CHAP. XV.

Of Seminaries, the best Method of ordering them and furnishing them with proper Stocks for Fruit.

ALTHO' I always take it for granted that every Gentleman coming to, or possessed of an Estate, is so wise, as not to be willing to lose *any* Part, much less the *best* Part of his Life in waiting for Fruit-Trees yet to be raised out of a Nursery; but will furnish himself without Loss of Time, from the best Nursery-Men near *London*; yet for as much as in a Fruit-Garden of some Extent there will be always some Vacancies to be filled up, either thro' Omission, or Misfortune, or Accident, it is very adviseable to have a Nursery of young Fruit-Trees always at hand to supply those Defects as Occasion serves, without the Trouble and Charge of going to Market.

For which Purpose then, a small Piece of Ground well mounded about with either Hedge or Wall, should be chosen, not lying too wet, and of a mixt Soil, and if possible, well defended from the *West* and *North* Winds with Trees of some Bigness. This is to be prepared by digging or ploughing in the Beginning of *October*, or sooner, and afterwards harrowed and made fine, cleaning it well from Weeds and Roots.

Lay out your Seed-Beds with a Line three Foot wide, and leave a Path of two Foot betwixt every Bed, as a Liberty to go between them to weed; and keep a distinct Bed for every several sort of Fruit; the Memory wherof should be preserved in a Plan of Paper, wherein the Beds and the several Seeds sown may be expressed, as before in the Case of the *Fruit-Garden*.

The Stones of Fruit should be carefully set in Rows, with the sharp End uppermost, three Rows in a Bed three Foot wide, and about two Inches asunder. I chuse to set them pretty thick, because the Stones, especially of Plums, are very apt to miscary. For which reason I follow Nature, and sow them rather as Nature directs, than in the common way of saving them till the Spring in Sand; that is to say, as they fall from the Tree when perfectly ripe, and that with the Pulp on. The sorts you are to set for Peaches and Apricots should be of the larger Kinds, the Muscle, the Pear-Plum, the red and white *Bonum Magnum*, and the black Damask: But because the Stones of Fruit generally follow the Nature of the *Stock*, the Stones sowed should be taken from such Trees as have not been grafted.

But the more expeditious Way is to get Plants or Suckers out of the Woods, where they are sometimes found in Plenty: But the *Suckers* should have one or two Removes, and be trim'd from their Spawnings; otherwise they are apt to be troublesome with their numerous Suckers afterwards. The Stocks for Cherries are also to be raised from the Stones of the *Black Cherry*, or from their Suckers out of the Woods, where they are plentiful enough; but no other sort is so fit either for grafting or inoculating as *that*.

The properest Stocks for Apples and Pears are to be raised in the Nursery from the Kernels, and sown by themselves on the aforesaid Beds in *October*, which is best and most expeditiously done, by sowing the very *Pouze* or *Must*, the Substance of the Fruit, of

which Cyder, Verjuice, or Perry is made. They will very freely grow, discreetly sown in that manner, and quickly reward you with Plenty of good Stocks for Fruit, as well as a Store of Plants to mend Gaps in Hedges: But there should be a careful Regard had to destroy the Mice, which are apt to devour these Seeds.

Hollies and Yews being such great Ornaments in every Garden of Pleasure, *they* ought to find a Place in this Seminary for Fruit; because they will not quickly overtop, or any way incommode the Nursery. But their Seeds not coming up the first Year (to prevent the Trouble of weeding) they may be laid by in any Corner, in a Heap of Sand, for one Year, and at *October* following, may be regularly sown in the Beds as above; and tho' they are slow in their Growth for two or three Years; yet if they be kept clear of Weeds, will after that make great Haste, and quickly reward the Planter with Pleasure and Profit.

It may not be amiss to let some Peach and Almond-stones have a Place in this Seminary; not only by way of Tryal to raise new sorts, but also for Stocks for Peaches; for altho' they do not make lasting Trees, yet they admit Inoculation something readier than the Plum.



C H A P. XVI.

Concerning the several sorts of Stone-Fruit, how to dispose them, whether for Walls, Dwarfs, or Standards, their Description, their Order and Time of ripening.

ACCORDING to the constant Observations I have made of the Mistakes committed in the Disposition of Fruit-Trees, I think my self obliged to be particular on this Head, and if possible, to give such a clear and distinct Account of their Nature, Properties, and Use, that we may no longer hear of Complaints and Disappointments for want of Information and Knowledge.

Of PEACHES and NECTARINES.

There is no sort of Fruit which affords us greater Varieties than the *Peach*, which tho' in the *West-Indies* it grows and bears on Standards and Dwarfs to great Perfection; yet in *England* I think it is seldom so mistaken as to be planted any where but against a Wall, tho' that Wall be not sometimes so good as it deserves, the Climate and Nature of the Soil considered. Nay, indeed some of the best and tenderest Peaches and Nectarines will not do at all in a Situation unguarded, and a Soil wet and cold, in whatsoever Latitude the Place is; and therefore I think should not be attempted; but their room taken up with *hardier* Fruit; being still of Sir *William Temple's* Mind, that a good *Plum* is better than a bad *Peach*.

I shall here select most of the known and valuable Kinds, describing something of their Nature, with the Order and Time of their ripening, that so every one may discretionally judge for himself, what to chuse and what to refuse.

But because I shall begin with those, which are first and earliest ripe, I think it proper to take this Occasion to say what I have all along observed to be true, and is (as I take it) a Rule without Exception; that all the *Præcoces* of every Kind of Fruit, whether Stone or Kernel-Fruit, *i. e.* every sort of Fruit that ripens much sooner than others of the same Species, is the *worst*, and wants something of its proper Flavour, and most commonly of its natural *Bigness*. Accordingly,

White and red Nutmeg.] The white and the red Nutmeg Peaches make their first Appearance with the Name and something of the Taste of a Peach; but have little else to recommend them, but that they ripen the Beginning of *July*, and sometimes sooner in a good Season; and if they be planted against a Wall, which they do not deserve. But where there is room, these commonly find a Place.

Ann-Peach.] The *Ann-Peach*, not so named from Queen *Ann*, but Mrs. *Ann Dunch* of *Berkshire*, who first gave it Birth, is much commended by Mr. *Switzer* for its early ripening the Beginning of *August*, and good Taste.

Royal George.] The *Royal George* is an excellent Peach, but lately known; deserves the best Aspect, and is ripe in *August*. I have already observed that it is very hard to be propagated by Inoculation, except on an *Apocot*.

White and red Magdalen.] The *white* and *red Magdalen* are valuable Peaches in warm Soils and well exposed. The *last* differs from the *first* by its later Ripening, and by its Redness at the Stone, which readily parts from the Pulp, which is rich and sweet. They have large Leaves, and much indented, with short and round Stones; the *white* is ripe about the latter End of *August*, and will do on an *East Wall* a little inclining to the *South*.

Minion.] The *Minion* Peach is by many admired for a good Bearer, for its Largeness and Beauty: And were it not sometimes apt to eat a little flat, it hath a very firm and melting Pulp; is ripe sometimes before the former, and therefore will do on an *East* or *West Wall*. This is said to have been a great Favourite of one of the Kings of *France*, and the Word is now accordingly used metaphorically.

Alberge.] The *red*, the *yellow*, and *violet Alberge* are all good Peaches in *August*.

Burdine.] The *Burdine* is not inferior to any of the former. It is not hasty to bear, but when it begins it amply makes amends for that Fault. For about *Midsummer* it must be disburthened of many, that the rest may attain their agreeable Beauty and Taste. Ripe also in *August*.

Montabon.] The *Montabon* ushers in the next Month of *September* with one of the best Peaches we have; for it is beautiful, high-tasted, hardy, and a never-failing Bearer on a *South-East* or *South-West Wall*. It is pretty strange that Monsieur *Quinteny*, who was so good a Judge of Fruit, should leave this (which excels most of its Season) out of his Catalogue.

Belle Chevereuse.] The *Belle Chevereuse* is a Peach that ought to have a Place among the Curious, for it is a good Bearer, and the Fruit is beautiful and of a sugared Juice. Its Shape is rather long than round, deserves a good Wall, and in that Situation is ripe the Beginning of *September*.

Noblefs.] The *Noblefs* is I think universally esteemed amongst us one of the best Peaches. For its good Qualities, of Largeness of Size, rich Taste, and plentiful Bearing, is not exceeded, some think hardly equalled, by any, and therefore it deserves a good Exposition, and kind Soil; by which Means it appears in Perfection in *September*.

Admirable.] The *Admirable* comes in also the Beginning of *September*, and challengeth his Name, as having almost all good Qualities, and no bad ones. It is round and large; hath a scarlet Coat, delicate Pulp, sugar Juice, and an high and exquisite Taste.

N. B. All the foregoing sorts (according to the Distinction the *French* rightly make between *Peaches* and *Pavies*) are, properly speaking, *Peaches*; that is, such as part from the Stone, and are of the more melting Nature. These, indeed are of such Esteem among the *French*, that the other which are called *Pavies* are very little set by, and are accounted watry and insipid. But without complementing away our Palates, the *English* venture to abide by their Judgment, when they say we have two or three *Pavies* of *English* Extraction, which equal, if not exceed any of the foregoing good sorts of *Peaches*. As for Instance,

New Newington.] The *New Newington* being a Week sooner ripe than the old one, challenges this first Place in order amongst the *Pavies*. It is a very fair and beautiful Fruit, and in some Years not much inferior in Largeness and Taste to the other. But yet,

Old Newington.] The *Old Newington* is a Fruit which the *English* justly glory in and deservedly boast of, as being not only a Native of our own, and of an ancient Family; but hath really all the Virtues and good Qualities that can be supposed to give Pleasure and Satisfaction to those that love Merit. It is a Disgrace to it to be planted in a wet Soil or cold Clay; for there it will neither prosper nor bear good Fruit; but if it hath Justice done it, and it be planted in a warm Soil, and good Exposition, such as *South* or *South-East*, you may expect to be rewarded every Year, the Beginning of *September*, with some of the most delicious Fruit a Garden can afford. For besides the Beauty of its most tempting Blushes, when it first changes Colour it afterwards affords the best Taste and the richest sugar'd Juice, with a Pulp of the highest and most vinous Flavour. In some Soils and Situations it will grow exceeding large: But it is always a *Bonum magnum*.

Of the Nectarine Kind or smooth Peach, which the *French* call *Brugnon*, we have some excellent sorts; and valuable Fruits they are. As,

Roman Nectarine.] The *Red Roman Nectarine*, large and red all over. It has a firm yellow Pulp; and if it is suffered to hang on the Tree till it is full ripe, as it ought, it is very full of Juice, and hath a vinous Taste, which gives almost universal Satisfaction to those who taste it about the Middle of *September*.

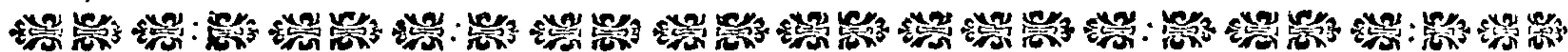
Elrouge.] The *Elrouge Nectarine* comes in also at the same Time, and being of *English* Extraction has been very much esteemed for its soft melting Pulp and vinous Taste. But it must give place to the

Newington Nectarines.] *Newington Nectarine*, which is now generally reckoned the most valuable and the best of Nectarines in all its Qualities, for Bearing, high Flavour, and Richness of Juice. It takes its Name from the Resemblance the Flowers have to those of the *Newington Peach*, and is ripe about the same Time.

Dutch Tawney.] There is also a *Dutch Tawney Nectarine* much admired for its Size and high Flavour, if suffered to hang on the Tree till 'tis revelled the latter End of *September*.

All these are yet succeeded by some others both *Peaches* and *Pavies*; but because these late sorts are difficult and uncertain, I chuse not to tire the Gardener, or burthen this Catalogue with any more but this one sort of *Pavie*, which for its excellent Qualities, ought always to be admitted, viz.

Katherine.] The *Katherine*, which though it ripens not till the Middle of *October*, is then a most excellent Fruit, and justly valued by all who know it. I need not say it requires the best Wall you can give it, because it ripens late: But with that Advantage we have seldom such Seasons even in the *North*, but that it makes an inviting Part of an Entertainment when the rest are gone. The Fruit is large and very beautiful, only sometimes it is bigger on one Side than the other, which makes the flatter Part a little insipid, even whilst the rounder Side is good and well tasted. It has one other good Property, that it will keep several Days good after it is gathered, if laid up dry.



C H A P. XVII.

Aprecots.

ALTHO' the *French* despise the *Aprecot*, as mealy and insipid, and fit only for *Compotes*; yet in *England*, with good Management, we find it an excellent Fruit, and therefore use it with the same Care and Art as we do the *Peach*; only they will do on Walls *East* or *West*, that have less Sun. There are not a great many sorts of this Fruit.

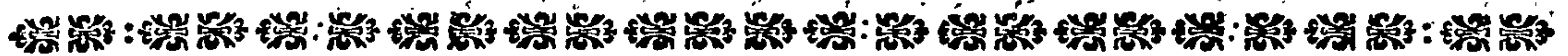
Masculine Apricot.] The *Masculine* or early *Aprecot* is that which makes its first Appearance near a Month before any of the rest, even in the Middle of *June*. But according to the Observation before laid down, being a *Præcoce*, it is much worse than any of the rest; and indeed finds a Place against a Wall only for its early ripening. A single Tree is enough for the Curiosity; for it is tender, and yet small, mealy and insipid, when persuaded to bear; wherein yet it will often fail, by reason of its early Blowing, and the Frosts in *February* and *March* overtaking its tender Blossoms.

Orange.] The *Orange Apricot* appears next, and is ripe some Years the first Week in *July*. It has a good vinous Flavour, if not suffered to be too ripe; but it cares not to part from the Stone, which with some is reckoned a Fault. However it is no bad Bearer, and ushers in

Turkey.] The *Turkey Apricot*, universally esteemed for its Hardness, constant Bearing, Largeness, and high Taste, if gathered and eaten as soon as ever it will part from the Stone. For indeed as it is the Fault, shall I say, or Misfortune, of every sort of *Aprecot*; that if it be neglected and suffered to hang on the Tree too long, it will be flat, mealy and insipid: But yet this is least subject to that Inconvenience, provided the Avarice of the Gardener suffer not too many to remain after *May-Day*, which as it is the Root of all Evil,

so it is the Foundation of this. This is so hardy and kind, that some Years I have had a Succession of them from *North-East*, and *North-West* Walls extremely good. There is also a *Roman* and a large *Dutch*; but,

Breda.] I shall only add to this Catalogue; the *Breda* or *Bruxels* Aprecot, famous and much valued for its bearing on Dwarfs or Espaliers. And it is observed when they are managed with Art in that manner, they afford a pretty, vinous and high-tasted Fruit in *August*: They will crack like a large round yellow Plum, and are speckled with little red Spots: They eat much better from the Tree than any of the sorts before mentioned; insomuch that I have often wondered it is not more planted and encouraged; seeing the Tree is contented with the Place and Stature of a *Plum*: But it must be set in a warm well-shelter'd Place; the Want of which, perhaps hath occasioned many Disappointments.



C H A P. XVIII.

Of Plums.

TH E R E are vast Varieties of this Fruit, and many good ones, one or other continuing in Season no less than four Months. The best sorts are a pleasing and delicious Fruit, though perhaps not so wholesome eaten in any Quantities. The chief and best take in order as follow.

Hastive, and *Mirabel*.] The *Hastive* and *Mirabel* are two *Præcoces*, and are only valued accordingly as they ripen in *June* and *July*. Of which Number is also the *Black Damask*.

Drab d' Or.] The *Drab d' Or* is a small round yellow Plum, whose Coat is speckled with red. It has a delicate sugar'd Taste. Will do well on a Dwarf; but will bear better against a Wall, where it will ripen the latter End of *July*.

Maitre Claud.] The *Maitre Claud* is a large whitish Plum, having a brisk tho' sweet Juice, and comes from the Stone; will do on Dwarf or Wall, is reckoned amongst the best Plums, and is thought to deserve an *East* or *West* Wall.

Blue Perdrigan.] The *Blue Perdrigan* is justly valued as the very best of Plums, and because it is not very apt to bear well, being tender in the Blossom, it justly deserves a good Wall. It is in vain to plant it either Dwarf or Standard; but on a *South* Wall and warm Soil, it will reward the Owner with the most delicious, high-tasted Fruit of this Season of *August*.

Royal Plum.] The *Royal Plum* is ripe also in *August*, will bear on a Dwarf, but more certainly against a Wall. It is large and round, and of a lively red Colour, especially on the sunny Side. It hath a sweet and fleshy Pulp, and is, I think, in all its Qualities, inferiour to none.

Rich Corbon.] *Rich Corbon* is a round middle sized Plum, hath a firm Flesh, and a most exceeding brisk vinous Juice. It doth not part from the Stone; but it is one of the best Plums, and would be more esteemed if it was a better Bearer, which Fault is yet mended against a good Wall, and in a warm Soil.

White Perdrigan.] The *White Perdrigan* is little inferiour to the *Blue*, something bigger and a better Bearer, even against an *East* or *West* Wall, and is the more to be valued and encouraged, because it succeeds the other.

Imperatrice.] The *Imperatrice* in Shape and Colour is like the *Blue Perdrigan*; but comes later. It sticks fast to the Stone, and hath a delicious Flavour, tho' it is so bold as to hang upon the Tree against a Wall till the Beginning of *October*, and if carefully gathered and laid single upon dry Shelves, will keep a great while in the House.

I need not say there are several other good Plums, well known; and therefore want no other Recommendation or Description, but giving them a Place in the Catalogue of good Plums, such as will bear well on Dwarfs, Standards, or Northren Walls: Such as these,

The *Red Bonum magnum*,
 The *White Bonum magnum*,
 The *Orleans*,
 The *Fotheringham*, or *Sheen*,
 The *Muscle*,
 The *Queen Mother*,

} The *Damascene*,
 } The *Violet*,
 } The *Green Gage*,
 } The *Morocco*,
 } The *Apricot-Plum*,
 } The *Damsen*, *White* and *Black*.

N. B. The Pulp of all Plums is yellow.



CHAP. XIX.

Of Cherries.

THIS is a Fruit so well known every where, that it needs no Description or Recommendation: But because there are several sorts of them, it may be necessary just to mention those which are generally esteemed best, and good Bearers. The first ripe is,

The *May-Cherry*, which being a *Præcoce* is valued only for its earliness: For it is small, and apt to be tasteless and insipid. If it is set against a *South Wall*, it will be ripe the very beginning of *May*.

The *May-Duke* appears next, and with a good Wall will be ripe the middle or latter end of *May*. But it never appears with its true Beauty and Taste, but on a Standard; whereon it bears admirably well, and will be ripe in *June*; when I have ever esteem'd it to have all the good Qualities of a Cherry and none of the bad ones. It hath a small Stone, a delicious full Pulp, and is moreover almost a never failing Bearer. So that were it not desirable to have a Succession, there should no other Cherry but this be planted. But for that reason it is adviseable to have also,

The *Orleans*, which is a very good Cherry, and bears well, either Wall or Standard: And so also is the *Bleeding-Heart*, *White-Heart*, and *Carnation*: But all of them have large Stones and little Pulp: And the three last are very uncertain Bearers without the advantage of an *East* or *West Wall*.

Merella Cherries are excellent Bearers, and are good, when thoroughly ripe the latter end of *August*, either eaten raw, or put into Brandy, and made into Compotes. They are best eaten off from Standards; but they grow large, and well deserve a Place against a *North Wall*.

Every one knows the common *Flemish Cherry* to be good from Standards, and are pretty constant Bearers; but when they are set against a Wall, tho' they grow larger, they are made sour and spoilt for eating raw.

The *Black Cherry* which grows to Timber and large Trees, every one also knows to be sweet and good. It is raised from Seed and common Foundation for all other Cherries to be grafted upon. There are found of them in some Places, particularly at the Reverend Mr. Butler's, at *Stanhope* in the Bishoprick of *Durham*, a sort having a very large Fruit, little inferior to the *Bleeding-Heart*, and a much better Bearer.

There is also the *Amber*, the *Black-Heart*, the *Cluster* and the *Morocco*; but they are not much encouraged, because they are bad Bearers.

C H A P. XX.

Of Kernel-Fruit, such as Apples, Pears, &c. How to dispose them; whether for Walls, Dwarfs, or Standards, their Description, Order, and Time of Ripening.

Of the PEAR.

I Have already directed the Government and Pruning this valuable Fruit, and I am now led to the Description and Properties of the several *Sorts* of Pears. And this is the more necessary to be done, because no sort of Fruit hath been generally more mistaken and less understood, to the great Disappointment and Grief of those who have been misled in planting and placing them. There are almost infinite Varieties of Pears; and it must be owned, that though we may and do exceed the *French* in the Art of managing and pruning the Trees; yet we are beholden to them for some of the *best* sorts, those especially that require a good Wall. In this Description I shall select all or most of the *best* in the order as they ripen: Only such as ripen in *July*, being *Præcoces* and valuable only that account, I shall satisfy my self just to name them, and proceed to the more valuable which follow in *August*.

July PEARs are,

The <i>Primate</i> or <i>Petit Hâstive</i> ,	}	The <i>Muscat Robert</i> ,
The <i>Little Muscat</i> ,		The <i>Great Blanquet</i> ,
The <i>Couffe Madam</i> ,		The <i>Long-tailed Blanquet</i> .

To answer the End of having these early, they may be set against Wall, which will hasten their ripening, but not make them better.

August PEARs are,

Jargonel.] The *Jargonel*. This is, I think, the first Summer-Pear that can be called *Good*: And indeed a large, beautiful and well-tasted Pear it is. It has moreover the Property of bearing very well; and because it is large and apt to fall from the Tree, it should not be suffered to continue on the Tree till it is full ripe. It well deserves an *East* or *West* Wall to keep it.

Hamden's Bergamot.] *Hamden's Bergamot* is of a flat Shape, tinged with Red on the sunny side, and hath a rich Juice, and bears best on a half Dwarf.

Orange Bergamot.] The *Orange Bergamot* is a Pear generally admired for its short Pulp and its rich, sugared, perfumed Juice. It is an excellent Bearer, either against a *Wall* or on a *Dwarf*. The first makes it bigger and earlier, but not better.

Katherine.] The *Katherine* is an old *English* Pear, undeservedly neglected of late Years, but it is not only most beautiful to behold, but grateful to the Taste, having a very high uncommon Flavour pleasing to most, though displeasing to some. It is in greatest Perfection on a Dwarf.

Ambrosca.] *Ambrosca* is a very beautiful good sized Pear, inferior to none of this Month; for if it is eaten before it is too ripe, it hath a rich Taste. Its only Fault is, that it often forgets its Benefactor.

Petit Ruffelet.] *Petit Ruffelet* is another excellent Pear of this Month; of a greenish yellow on one side, and red on the other. It hath a short and sweet Pulp, and not disagreeably perfumed. Is best on a Dwarf.

Musk Bon Chrétien.] *Musk-Summer Bon Chrétien* is the first of that Name that appears, and is valued chiefly for its high Perfume, pleasing to Some, and the aversion of Others.

PEARS which ripen in September are;

Summer Bon Chrétien.] The *Summer Bon Chrétien* of great Antiquity, well answering the Name of a good Christian, *Sound at Heart to the last*, its *Heart* or *Core* being observed to continue uncorrupted even when the Pulp is decayed. This is a true *Bonum magnum*, having a noble, short, high and juicy Taste; and on a good aspected Wall, will sometimes be so large as to weigh fifteen or sixteen Ounces. It is a great Pity 'tis not always a good Bearer. But I venture to say a great part of its Barrenness is owing to mismanagement. For it is commonly placed amongst the rest of the Wall-Fruit, where it hath neither Elbow-room, nor Height to extend its slender and bearing Branches: Whereas (as I have formerly observed) this Tree frequently bears even at the Extremity of the last Year's Shoot, and therefore it should have room both side-ways and upwards; and then I have found it to bear well enough, if the Knife has not been too busy in *shortning*, but employ'd only to cut out the great Wood.

Verte-Longue.] The *Verte-Longue* discovers its Shape and Colour by its Name. It hath a wonderful soft and melting Pulp, and an exceeding thin Skin. Bears very well on an *East* or *West* Wall, and acquires a very high vinous Taste, if the Soil be not too moist.

Dean-Pear.] The *Dean-Pear*, on the account of its Shape and Bigness, is often mistaken for the *Summer Bon Chrétien*: But although it hath a melting Pulp and musky Juice, yet it wants the other's high Flavour. It should not therefore be suffered to be too ripe, for then it is apt to grow mealy and insipid.

Autumn Bergamot.] The *Autumn Bergamot* is so well known, that it hardly needs any Words or Description to recommend it, for if it may not be said to exceed all other Pears; yet at least it must be said, there are none yet known to *exceed* it. But as it will not last long, we are glad to find a Succession of other good ones to imitate it. Its excellent Quality is, that 'tis better tasted from a Dwarf or Standard than from a Wall. In a wet Soil and cold Situation it will not prosper, and so it is sometimes set against a *South* Wall; which indeed makes it *bigger*, but takes off much from its true Flavour and inclines it to be insipid.

Buree du Roy.] *Buree du Roy* is another incomparable Pear the latter end of this Month. It is large and beautiful, and a never-failing Bearer; but it ought to have a Wall of a good Aspect, and not thrust against the *North*, as is the two common Practice; for though it will *bear* so placed, yet the Fruit is insipid and watry. Whereas used with Care and Civility, it is a Fruit of a noble Size, delicious melting Pulp, and vinous Juice, and therefore claims equal Merit with the very *best*. It thrives well in a loamy Soil or mixt Clay; but in a light Sand without some agreeable Mixtures, it will not be persuaded to grow to any bigness.

PEARS ripe in October.

The last three or four mentioned Pears continue a good part of this Month also; when there are some others present themselves. As,

Monsieur John.] The *Monsieur John*, both the *Golden* and the *Grey*, are good Pears against *East* or *West* Walls: The first is an old Pear, and hath a fine sugared Juice, and the other hath something a firmer Pulp, and will keep a little longer.

Cressane.] The *Cressane* is a fine large round Pear, and deserves a good aspected Wall. It is speckled almost all over with red Spots. Its Skin is rough, but its Pulp extremely tender and full of Juice, attended with an agreeable Sharpness. It is first *grey*, but turns *yellow* as it ripens.

Swan's Egg.] The *Swan's Egg*, considered in all its good Qualities, is one of the best Pears, and ought much to be encouraged. It bears well, either on Standards or Dwarfs. But many who are Lovers of this Fruit are apt to spoil it with Kindness, when they plant it against a *South* Wall; where like many others it grows indeed larger, but is made thereby mealy and insipid. On a Dwarf or rather half Dwarf, it arrives to great Perfection most Years, and seldom fails of a full Crop. It hath a most agreeable melting Juice, with a high vinous Taste; and which is a considerable Part of its good Character, having a thick Skin, it will sometimes keep in Perfection (after it is ripe) near two Months; for I have my self eaten them very good at *Christmas*.

Marchioness.] The *Marchioness* is large, and shap'd like the *Winter Bon Chrétien*: 'Tis russet when gathered, but it grows yellow as it ripens. Is very melting, and of a sweet musky

musky Juice; so that it claims a Place amongst the best Pears, deserving an *East* or *West* Wall.

Callio-Rosat.] *Callio-Rosat* is much admired by many. Is of the colour, shape, and bigness of the *Monsieur John*. Hath a very short Stalk, and is set hollow like an Apple; will do well on *East* or *West* Walls, or on Dwarfs.

The *Lansac*, the *Besi de la mot*, the *Green Sugar Pear*, the *Besideri*, and the *Swiss Bergamot*, are all in Season this Month.

P E A R S ripe in November.

Virgulee.] The *Virgulee* is an old Pear and much esteemed, having a very melting Juice. It is green when gathered about *Michaelmas*, but it grows yellow as it ripens. There is a particular Misfortune attends this Pear; for it is apt to taste of whatsoever it is laid upon, especially in a close Place, for which reason it bears Carriage not well. Oaken Shelves to lay them on to ripen in the House, are best. It deserves a *South-East* or *South-West* Wall.

St. Germain.] The *St. Germain* is another admirable Pear; greenish and spotted when taken from the Tree, but grows yellow as it ripens. It is full of Juice of a lemonish Tartness, very pleasing to most. The Tree is a good Bearer on a Soil that is not too light and dry: But it deserves the best aspected Wall. It will keep good till the latter end of *December*.

Winter-Thorn.] *Epinè d' Hyver*, or *Winter-Thorn*, is a handsome pyramidical Pear, green upon the Tree, but yellow when ripe, with a sattin Skin. Its Juice is greatly perfumed, and very melting, if it have the advantage of a good Wall.

Spanish Bon Crétien.] The *Spanish Bon Crétien* is a very good Pear on a *South* Wall, and it is thought to deserve that advantage for its handsome Bulk, short Pulp and sugar'd Juice; to say nothing, that it answers its Name and Character.

Lewis Bon.] The *Lewis Bon* is shaped much like the *St. Jermin* Pear, hath a smooth Skin, greenish and speckled, and a Juice very rich and sweet, especially on a dry Soil. It should have the advantage of a Wall, for its Fruit is apt to fall off.

P E A R S ripe in December, January and February.

Besides that, most of the Pears before mentioned for *November*, will also keep and be very good for the whole Month of *December* or longer, there are also some of the very best Pears yet to come, that present themselves to the Taste of the Curious with no small Merit. As,

La Chassery.] The *La Chassery* is a middle sized Pear of the Shape of an Egg, greenish, and sometimes speckled, having long Stalks; its Pulp is very melting, and its Juice sugared and a little perfumed, so as to be agreeable. It loves a dry Soil, and expects a good *South* Wall to free it from being watry.

Ambret.] The *Ambret* hath many of the Properties of the *La Chassery*, and is much of the same shape and bigness, but more inclining to be grey and speckled, and is something longer before it bears. It is esteemed an excellent Fruit, melting and sugar'd, and deserving of a good Wall.

Colmar.] The *Colmar* now presents itself to us almost Faultless and in Perfection. For though it is one of the last good Pears, and continues when most others are gone, even in the coldest Seasons of Winter, yet there is (as it were) a *Recapitulation* of all the good Qualities of other Pears centered in this. It is shaped much like the *W. Bon Crétien*, and is often mistaken for it: But it is quite another Pear. It hath a large Crown sunk very hollow; is greenish from the Tree; but hath some Blushes of red and yellow when it comes to be ripe. It is a large Pear, of a tender Pulp, with a very sweet and sugared Juice: And the Tree makes a very handsome Figure when it is laden with Fruit; but that must not be expected till after five or six Years planting. It is ripe when it yields to the Thumb, and not before. By what I have said it will easily be perceived, that it deserves a good warm Soil, and a warm southern Exposition.

W. Bon Crétien.] This is a Pear of great Antiquity, and hath obtained a Credit and Reputation answerable to its Name. Some are apt to think there are several sorts of them; but they are all one and the same Fruit; only the difference of Soils, Expositions, Seasons of the Years, and Condition of the Tree may make great Alterations both in Shape and Goodness. In Perfection it is fine Fruit, and oft weighs more than a Pound. But it may hardly be said to be agreeable to our Climate, even set against the best Walls, and

for want of Sun generally proves watry and insipid. They are best grafted on a Quince-Stock, and set against the *South Wall*, where they may have Liberty to run. They are excellent indeed to bake : But it is generally thought a *South Wall* may be better employ'd than to produce *baking Pears*.

The following Pears are not to be despised, but are admitted into the best Gardens, viz. *St. Andrew*, *Martin Sec*, *Petit Orin*, and the *Carmelite*; but they all require a *South Wall*.

The *baking Pears* most in Repute, and which will do well either on half Dwarfs, *North-East* or *North-West Walls*, are the *Cadillac*, the *Pound Pear*, the *Black Pear* of *Worcester*, the *English Warden*, *Parkinson's Warden*, and a Pear called the *Lord Mayor's Shew*, whose Fruit is strip'd with yellow and green, and is a free Bearer.

N. B. Most Pears are known by their Leaves.



C H A P. XXI.

A Catalogue of the best Apples.

OF this sort of Fruit likewise there is almost infinite Variety, every County in *England* having its peculiar Favourite. However, that a Lover of Planting may not be under too great Perplexity in his Choice of the best sorts, I will here set down a Catalogue of such as are unquestionably good, not exclusive of many others that may be called so too.

The *Genneting*. A *Præcoce*,
 The *Summer Queening*,
 The *Golden Pippin*,
 The *Golden Renating*,
 The *Golden*, or *Aromatick Russet*,
 The *Golden Monday*, or *Pear-Russet*,
 The *Queen's Pearmain*,
 The *Summer Pearmain*,
 The *Winter Pearmain*,
 The *Kentish Codlin*,
 The *Kentish Pippin*,

The *Kirton Pippin*,
 The *Stone Pippin*,
 The *Non-Pereil*, the very best for all Uses,
 whether the Table or Kitchen, or for
 Cyder, and bears most plentifully, best
 when grafted on a Quince or Crab,
 The *Holland Pippin*,
 The *Paradise Apple*,
 The *John Apple*, or *Deux Ans*,
 The *Margil*,
 The *Bell voir Pippin*.

Vines usually planted in *England*, and will ripen with us are,

The *July Grape*, a *Præcoce*, and there-
 fore not very good,
 The *White Sweet Water*,
 The *Black Cluster*,
 The *White Muscadine*,

The *Blue and* } *Frontiniacs*,
 The *Grizley* }
 The *White Frontiniac*, though an excellent
 Grape, seldom ripens in *England*.

C H A P. XXII.

Of the Gooseberry, Currant, Philbud, Raspberry, and Strawberry.

BEfore I mention the several sorts of Gooseberries and their Uses, it may not be amiss to direct the best Method of propagating and encreasing *them* as well as Currants: And this is the more necessary to be done, because all the Authors that have hitherto treated on this Subject, have (at least as far as I can find) plainly mis'd it, or else have led the Planter into the common Mischief and Inconvenience attending this useful Shrub.

The three usual Ways of propagating the Gooseberry and Currant, are either by *sowing their Seeds*; but here, as in almost all other Cases, Nature is apt to degenerate, and you can never be sure of the sort you would have this way. Or else by *Cuttings*; or lastly, by *Off-Sets* or *Suckers*. By the two last Ways the End is effectually attained; but then in the common Method of Practice, the Trees are pestered afterwards with such numerous *Suckers*, that without great Care, and continual Amputation, they will never be kept uniform upon one Stem; whereby also they are weakened and hindered in performing their proper Office.

To cure then this Inconvenience, I have by Experience found, that if from a Cutting or Off-set of a Gooseberry or Currant, you take off with a sharp Knife all the swelling Buds, as far as you intend it to be thrust into the Earth, or to be covered, the Tree will never afterwards put forth *Suckers*, but stand regularly upon one Stem, and form (as it should) a round Head, which is always observed to afford the largest and best Fruit.

The reason of taking of the Buds is founded on this Observation; That from those Buds Nature forms the *Suckers* or *Off-Sets*, and not the *Root*, as is generally thought. For the Root is formed in the smooth Places between the Bark and the Wood, as is plainly seen in those Cuttings which are deprived of their Buds, which take root very readily, tho' they do not put forth Suckers.

This Observation is of great Use also to those who make use of Suckers as a Foundation for Stone and Kernel-Fruit, as in the case of Plums and Pears, whereon are inoculated Peaches, Apricots, and the best Pears: For if prudent Care be taken to *dis-eye* the Suckers as far as they are covered in the Ground, (though I have not had experimental Proof of *this*, yet) by Analogy of Reason, this should be an effectual Remedy to prevent a multitude of Suckers so troublesome in Borders, and injurious to the Fruit-Trees: The Cuttings of Codlins should also be thus managed.

Gooseberry.] The following Kinds of *Gooseberries* are chiefly worth our Notice, and should be encouraged, *viz.* The *White Dutch*, excellent for eating; the *Large Amber*, best for baking when green; the *Walnut Gooseberry*, remarkable for its largeness, and is first ready for Tarts; the *Red* or *Black, Hairy* or *Bearded Gooseberry*, is a very pleasant and much valued Fruit, both for eating raw or baked, and preserving. It would be endless to mention all the several sorts which are raised every day from Seeds: But it may not be amiss to say there is a *Champaign Gooseberry*, a *Præcope*, no otherwise valued, but that it comes ten days sooner than the rest.

Currant.] The three remarkable sorts of *Currants*, very different from each other, are the *Large White Dutch Currant*, which is an admirable Bearer; and if set against a Wall, in the intermediate Spaces between young Fruit-Trees, will produce Fruit sometimes as big as Grapes, and not much less pleasant. The common *Red Currant* is a good Bearer, and will hold its Fruit till *Michaelmas*, if preserved with Mats from Birds. And the *Black Currant*; the Flavour of which, though it is displeasing to most, yet for Variety's sake, and some medicinal Uses should not be wanting. The physical Taste is much lost, when used either in Tarts, or put into Brandy instead of Black Cherries.

Both the *Gooseberry* and the *Currant* should be kept upon one Stem, with a roundish Head a little open in the middle; still observing to take away every Year some of the *oldest Wood*, as also all the *large white Wood* of the last Year's growth: For it is the Wood of two or three Years old, and the *small white Wood* from them, that bears the best and largest Fruit.

Philbud.] The *Philbud* is an improved kind of Hazel, and bears a Fruit much admired by most, especially as an Amusement over a Glass of Wine after a good Dinner. The *Scarlet* sort is most valued, and is reckoned to have the thinnest Shell and the highest Flavour. You are never sure of a good sort from the Seed; therefore they are generally raised

raised from *Suckers* or *Off-sets*; which (to prevent their unreasonable multiplying at the Root) should be used as the Gooseberry in the Method of their Propagation.

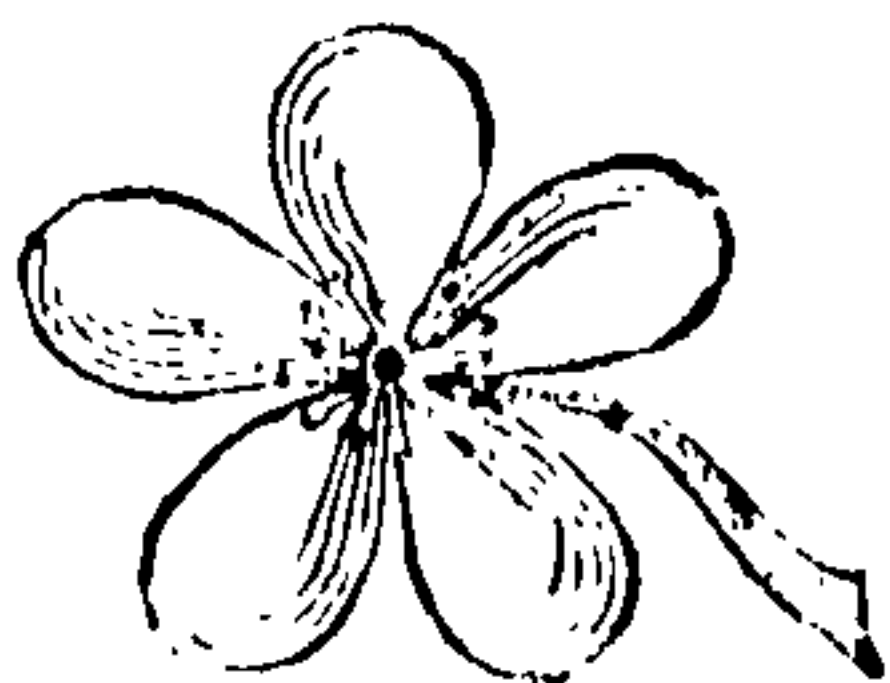
Raspberry.] The *Raspberry* is a Fruit of a prevailing uncommon Flavour, pleasant and acceptable to most. They grow wild in the Woods about *Durham* in great abundance. I could never discover more than two sorts of them, the *White* and the *Red*. The first wants, I think, something of the true *Flavour* of the last, and therefore is not so much esteemed or encouraged. They will prosper almost in any Soil, but love the Shade; where, though the Fruit will not be so *early*, yet there it is *largest* and *best*. They are propagated, either in *Autumn* or *Spring*, from *Off-sets* of the last Year, pruned to about a Foot and a half. Little or no Fruit can be expected the first Summer, not a great deal the second, but the third Year will produce a full Crop from the Shoots of the *preceding* Year. Most Authors have directed the keeping them clean from Weeds: But as this is a Plant which loves *Coolness* and *Moisture*, I have found that the lesser Weeds are rather an Help than an Hindrance, and therefore they may be left to themselves after they are pruned to three Foot high in *March*, provided they be kept clear only from Docks, Nettles, &c. all the dead Stalks being removed in the Spring.

Strawberry.] The *Strawberry* next justly challengeth our Observation and Regard. Of which we have chiefly *four* sorts, all of them much coveted and eagerly sought after, as they present themselves at such an early Season of the Year, when Novelty excites an impatient longing Appetite after Fruit in general, hitherto so long deny'd, and in vain expected.

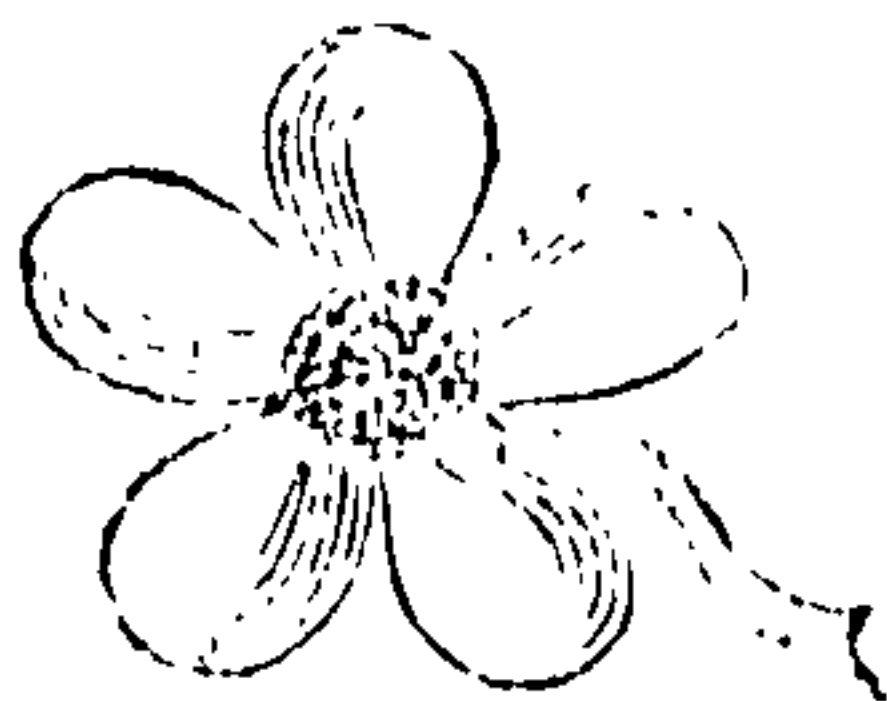
The first and most early ripe is the *Virginia* or *Scarlet-Strawberry*, which if it have the Benefit of a good Exposure and a light Soil, will be ripe the middle of *May*. However, Strawberries of all sorts naturally delight in an heavier Soil inclining to Clay; which if it be help'd with a Shower of Pidgeon Dung in the Spring, will produce a wonderful Crop, and very large Fruit.

The *Hautboy* or great *White Strawberry*, is an admirable Bearer in a proper loamy Soil or mixt Clay; hath a very agreeable Flavour, and sometimes arrives to the bigness of a small Walnut. This Plant is not so well understood as it ought; otherwise it would be more propagated than it is: But the *Soil* and the *Sort* hath discouraged many. The *first*, if it be too light may be easily mended with Clay or Marle. But the *other* wants to be explained; for I have never yet seen that Author who makes the proper Distinction betwixt the *true* and the *bastard* Kind. The *true* sort is never to be known and distinguished from the other, but at the Time of blossoming; when it may be observed, that the little Fibres that proceed from the middle of the Flower are *short*, lying close and snug to the white Petals or Leaves: Whereas the other *bastard* Kind hath its Fibres *staring* and *starting* out much *longer*. This Kind never bearing any Fruit, should always, as soon as discovered, be rooted up immediately, that the *true one* may be put in his Place. In many Places I have observed more than half of this *bastard sort* to get Place in a Strawberry-Bed, and the Masters never understood the Reason of their Disappointment till I explained it, and gave them better Hopes. However, to make this Difference better understood, and the *Truth* appear, I have annex'd the Figure of both as nearly as can well be expressed.

The Bastard Sort.



The True Sort.



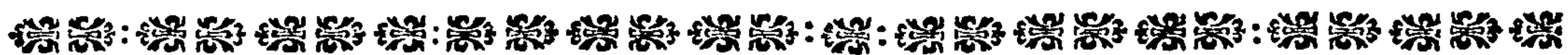
The third sort is the *little Wood-Strawberry*, which is also of two Kinds, the *Red* and the *Yellow*; both equally good and constant Bearers, and make an agreeable mixture at the *Desert*. The Slips of the *first* degenerate, and therefore should be fetch'd from the Woods, and planted anew once in three or four Years: But every Year fresh Earth or Pidgeon Dung ought to be thrown amongst them in the Spring, which will help to refresh and cover their Roots, which are apt to be thrown out of the ground by the Frosts. And at Midsummer, if the Fruit is desired to be large and fair, the Runners should be carefully taken off, so as to leave all the Plants *single*.

The *Wood-Strawberry* will sometimes bear twice a Year, in *June* and in *October*, if the Season be favourable, and warm Rains come. But the most certain way to make them bear

bear in *Autumn* is to cut down the Leaves and Flower-Stems, just before the Blossoms open in *May*, and they will shoot out afresh and bear ripe Fruit in *October*. If some of the strongest Roots be set in Pots and put on a gentle hot Bed in *January*, they may with Care be so ordered as to produce Fruit in *March*: But Fruit in all these artificial Ways is always flat and insipid.

Berberry.] The *Berberry* is a Plant that should not be neglected or forgotten; for it is a pleasant Shrub, bearing beautiful Branches of yellow Flowers in the Spring, and no less pretty Clusters of red Berries towards the *Autumn*. The Fruit has an agreeable Acidity when it is ripe, tho' it is seldom used any other way but in Sauces. We are told of a sort without Stones, which because I have never seen, I cannot recommend; but such must be more valuable in Sauces. They are propagated by Cuttings and Suckers, and therefore to prevent their spreading so much at the Root, they should be served like the Suckers of Gooseberries, as is before directed.

Having thus gone through all the Particulars and Articles of Fruit usually planted in a Fruit-Garden, directing at the same time their management and manner of Cultivation, shewing their Natures, Properties and Use; I shall now proceed to say something of the several Diseases Fruit-Trees are subject to, pointing out at the same time, the most probable Cures and Remedies for them. To which I shall add afterwards a Chapter of Blights, and the most probable Occasions of them, that thereby we may be help'd to look out for a Remedy and Defence.



C H A P. XXIII.

Of the Diseases of Fruit-Trees.

Fruit-Trees are subject to many *Infirmities*, which weaken and destroy them; so that we may properly say they are liable to Diseases and Distempers like other Animals. Yellow Leaves out of season, or blistered with red Spots, new Shoots growing black or drying on their Extremities in Autumn, Fruits remaining small or dropping off unseasonably, are so many Symptoms of Weakness and Decay, either in the Head, Stem or Root.

I have been tempted to think further, from some Observations I have made, that there are some certain Diseases in Trees something analogous to those in Human Bodies. Among which there are some that may be cured with the Assistance of Remedies, and others which hitherto appear incurable, since whatever can be done to them hath still proved ineffectual.

I have had Pear-Trees directly in the *Measles*, the Leaves of the whole Tree being all over spotted with red; which Spots in the *Autumn* became blistered, hollow, and full of small Holes, which I suppose to be the Passage for Insects to go and lay their Eggs, of which I could discover innumerable Quantities by the help of my Microscope. It is very hard to say what should be the cause of this Disease; but I have observed it more than once in several Gardens besides my own: And it is remarkable too, that though the Tree continued in a state of Vigour, yet the Leaves and sometimes the small Twigs became every Year more and more meazled and blistered, till it became a frightful Sight: The Fruit fell off before it was half ripe, and *that* put me upon a Resolution to cut off the Head of the Tree to form new Wood; but I quickly found the Disease continued, and in that state I left it at *Twelve* o'clock.

I am apt to think the Foundation of this Disease was in the Root, for I saw nothing of it, till the Pear-Tree Roots might be supposed to reach an ill-natured untractable Clay, which lay within a Foot of the Surface. There may be also something in Mr. *Bradley's* Conjecture, that the Blisters were occasioned by the Hail-storm bruising the Leaves and giving occasion thereby for such Insects as floated and circulated with the Juices in the Vessels of the Tree to lodge there as a Nest for Eggs. For (as he further rightly observes) "All Insects, as they are of different Kinds, have respectively proper Places where they lay their Eggs to be enlivened; and those Places I always observe are actually in a state of *Putrefaction*: So that it seems as if the putrid Juices of Bodies, either Animal or Vegetable, were essential to give Life to the Eggs of Insects, and nourish their Young."

“ I believe (saith he further) it will not be difficult to conceive how the Eggs of some small Insects may pass in Crowds thro’ the Vessels of Plants, when we consider their exceeding smallness: For many Kinds which I have examined with Microscopes do not singly fill more Space than one Tenth Part of the Orifice of a *Wood-Vessel*, so that they might pass through such Pipes without Interruption. And the Pores and Vessels of the *Roots* are still larger than those in the Trunk, and as capable of receiving them as they are of taking in their proper Nourishment from the Earth. I am of Opinion, that most Kinds of Plants have continually the Eggs of some sort of Insect or other circulating with their Sap, which cannot be enlivened as long as the Plants are in health, and the Sap full of Spirits; but only when they meet with some wounded or decay’d Part, where the Juices begin to corrupt.

But whatever Accident might be the Occasion of this Distemper, the Remedy (as far as I can find) is still a Secret. And I am apt to think there can be no Cure, except the Foundation be removed, *i. e.* to plant another Tree and in a better Soil. For I try’d Mr. *Bradley’s* Conjecture, and made use of Quicksilver several ways, both by boring in the Stem, and by *plastering* some of the main Branches, first peeling off the outward Rind: But (as I take it) there not being Heat enough in the Sap of a Tree to set the Mercury in motion, as there is in the Blood of an Animal, the Mercury had no manner of Effect, and made no sort of alteration.

Another Disease I have observed some Fruit-Trees to be subject to is, *The Dead Palsey*; as when the Circulation of the Sap is of a sudden stop’d by Blast or Canker, or other Accident, one *Side* or *Part* of a Tree presently languishes and dies, and sometimes the *whole*, when it seizes the Stem or Part where it was inoculated. There is no Remedy for this, but only to cut out the *affected* Part, and to recover if possible, the Beauty of the Tree from the Part *unaffected*.

Again, *Gum*, or a continual Running of viscous Matter from some one Part of a Tree, especially a Peach, is another incurable Distemper. When it appears only on a Branch there is hopes, cutting only that Branch two or three Inches below the Part so distempered; by that means the *Gangreen* may be hindered from extending further. If it discover itself about the Bud or Graft, or all over the Stem, the best way is to lose no more Time about it, but to provide another for its Place. Too great Richness of the Soil, or dunging the Borders, is often the occasion of this Distemper.

Many Fruit-Trees are observed to labour under a gradual Decay of *Consumption*, without any visible Tokens or Reasons of their Weakness. This is sometimes occasioned by bad, withered, wounded *Roots* at first Planting; and if so, it commonly ends in Death. But if it be occasioned by Insects seizing and gnawing the Roots within the Ground, such as Cock-Chafers and Worms, which afterwards prove Breezes or Gad-flies; in such case it is proper to search narrowly the Roots of the Tree in order to remove and destroy them; putting in at the same time as much fresh *untried* Earth as is possible: And this will give new Life and Vigour to the Tree. A multitude of Piss-Ants are likewise often the occasion of languishing *Consumption* in Fruit-Trees, by eating away all the Fibres and even all the outward Coat of the larger Roots. *These* after they are well and frequently disturbed by digging about the Roots, and tempted to get together in Bodies, by raw Flesh or dew Worms cut in pieces strew’d about the Borders, may be easily destroyed by scalding Water, discreetly ordered, so as not to injure the Trees.

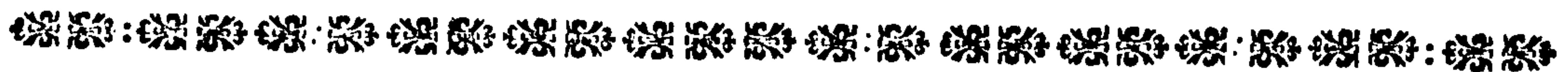
Another Distemper which most Fruit-Trees are subject to, is the *Yellow-Jaundice*: But this, being almost wholly owing to a wet Soil, and an indiscreet planting them too low, if the Disease hath not continued too long, is capable of a Remedy. To be buried alive is the worst Way of losing Life. The Practice is too frequent in Vegetables, and is discovered to be a Misfortune, when the Leaves and sometimes the smaller Branches turn *Yellow*, long before the Season. If the Distemper is not remedied in time, it may be too late for a Cure, and Death will follow. But if after three or four Years planting, a diligent Care be used to raise the Tree considerably, all may be set to Rights. This may be done by first removing a good Part of the Earth from about the Root, and then by the help of two Men with Spades opposite to each other, the Tree may be gently and gradually raised to its proper Height, even till some of the bigger Roots appear two or three Inches above Ground; and then, having some *untried* Earth ready at hand, let a third Person carefully thrust as much of it as possible (whilst the Spades remain in the Way of *invers*) into all the Vacuities with the hand, that the Tree may not *sink* again. By which Method it will quickly be seen what was its Distemper, and the occasion of it, even by the following Verdure of the Leaves, and the thriving of the Tree.

The *Canker* is another Distemper, which most Kernel-Fruit are subject to; and some sorts of Apples and Pears more than others. The chief Occasion of it is, either a hungry Gravel, or Sand lying near the Surface, or a cold moist stubborn Clay; into either of which, when the Roots come to enter and find a Passage, many of the uppermost Branches will discover their *Dislike* by a *cankorous* Humour, which sometimes seizes them only half way, but most commonly quite round the small Branches, so that they die immediately. Nay, this Distemper many times seizes the very Stem and Body of the Tree; whereby it becomes wounded, mangled, and defaced. But yet so long as the Canker doth not quite surround any one Part of the Stem of an Apple-Tree, and leaves but a narrow Path for the Ascension of the Sap, it is remarkable that such a Tree is most prolific; and so long as it continues, though in its weak State, and with a *broken* Constitution, never fails to bear a good and plentiful Crop; agreeably to the Maxim I have all along laid down, *That every convenient Check of the Sap in its free Circulation, which way soever performed, though it stops and hinders the luxuriant Growth of Wood, yet always tends to the Production of Fruit, and more or less disposes every Fruit-Tree to bear.*

Where this Distemper attacks the Stem or Branches of the Tree quite round, all *above* the Sore must necessarily die: But when it affects it only in Part (as commonly it doth) in such a Case a Stop may be put to it, by cutting to the Quick as far as the Canker reaches, and applying Cow-dung tempered with Clay to the Wound, tying it round with Bafs-Mat or Woollen-Yarn: By this Means the Sore will soon skin over and recover: But the best way in future Planting is to remove (if possible) the *Cause*: That is to say, take away the Gravel, Sand, or Clay, and fill up the Place (not with Dung but) with a mixt Soil or *untry'd Earth*; and plant *high*, even on the *Top* of the Surface.

Another Distemper still which some of the best and tenderest Pears are subject to, is a *Lousiness* all over the Branches in their outward Coat or Bark. The whole Bark will look like so much Net-work, diversified and broken into innumerable Figures, in the Chops and Craks whereof are lodged infinite Numbers of little Animals invisible to the naked Eye. And I have this Reason to believe these Animals pass and repass in a continual Circulation, even in the Sap-Vessels; because the Fruit itself I have more than once observed to be gradually covered, as it increased in Bigness, with this sort of Net-work, something like that of the Melon, only full of Eggs and Animals. The Tree will live and bear Fruit several Years after it is thus attack'd: But it will gradually decline in its Vigour, and the Fruit will at length become small and insipid. The Evil is in the Root and the Soil; and therefore to remove the greatest part of *both* might be a very probable Remedy, and should be attempted where the Fruit is much valued and set by; otherwise I should think the best way is to lose no more Time, but provide another for his Place.

These are the chief of what may properly be called *Diseases of Trees*: As for *Disasters* and Accidents attending them, those will be more properly considered in the next Chapter, where I shall attempt an Explanation of *Blights*, and endeavour to enforce their Remedies.



C H A P. XXIV.

Of Blights.

MOST Fruit-Trees are subject one way or other to be attack'd, either in their Leaves, Blossoms, or tender Branches by many outward Accidents; and the unkind Seasons, which we, who live in an Island too often experience, frequently subject them, (even when they are least able to bear it, in the Spring) to the Injuries of *Frosts* and *Blasts*; whereby the Blossoms and tender Fruit are *shrivelled*, *mortified*, and *blighted*; and sometimes the very Tree itself will discover some melancholly Signs of a Chastisement from above, so as immediately to shrink, wither, and die.

These Things are the real Grief of the diligent Gardener, when he sees all the Fruit of his Labour and Care *blasted* at once, and his forward Expectations brought to nothing even in one Night, from the Infelicity of *cold Dews*, *black Winds*, *Storms of Snow* and *Hail* succeeded by *Frosts*; ravaging, and as it were scorching every thing tender that stands in their way unguarded.

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It is observable that they who live on the Continent (even in the same Degrees of Latitude) do not feel these Severities in the Spring as we do, having a more equal regular Warmth from the Sun and more certain Seasons: Tho' it is more than probable, that many of the Disasters we feel from *Blights*, are brought to us in the Eggs of Insects floating in the Air by Easterly Winds, so frequent in the Spring; as the ingenious Mr. *Bradley* hath with a good Shew of Reason conjectured. However (as a *Salomen Miseris*) they who live on the Continent are not without their Complaints neither. They are subject (especially in the most Southern Parts) to violent and sudden Hurricanes, frequent Thunder and Lightning, attended with such excessive *Weights* of Rain and Hail bursting out of the Clouds, that they sometimes see with Grief enough every thing round about them destroyed at once. And yet, before either of us complain too much, we should look *inwards* as well as *upwards*, and consider well whether we deserve a better World than this, and for what End we came hither. In the mean time our loving God hath given us Reason and Foresight, whereby not only to cure the *inward* Diseases of our Bodies, and alleviate their Malignity by preventing Remedies; but also to guard against *outward* Misfortunes of all sorts, and even those which so sensibly affect our tenderest Fruits and Plantations, proceeding from the evil Influence of a malignant Air.

In one of my former small Treatises on this Subject I have, I think, *plainly*, though *briefly* hinted at the Nature of *Blights*, and the ordinary Methods whereby Fruit-Trees are found to be attacked, in order to attempt a Remedy; and I am so well satisfied, that I have rightly touched both the Disease and the Remedy, that I shall only here further open and explain *both*, as further Experience and Observation shall naturally lead me to do.

In all *low* and consequently the *best* Situation for a Fruit-Garden, I have observed, that all or most of the worst Frosts and Blights both in Spring and Autumn fall *perpendicularly*, *i. e.* as perpendicularly as the Motion of the Air will suffer them: For the condensed Vapours falling from the upper Region do there commonly form themselves at Night toward the Surface of the Earth in a sort of Dew or Mist, consisting of watry Drops more or less condensed. And because every thing *moist* or *wet* is most subject to be affected by the Coldness of the Air; therefore the more any thing lieth upon, and exposed to this perpendicular Descent of Vapours, the more will it be subject to be *frozen*, or (which is the same thing if it be tender) *blighted*.

Both Reason and Experience confirm this Truth to us: As in the Case of a Fruit-Tree planted against a slope Wall for the Advantage of receiving more of the Sun's Rays; this we always find to be first and most subject to be blasted both in Spring and Autumn. And again: I have frequently observed the Leaves and tender Shoots of a tall Ash-Tree in *May* to be frozen, and as it were *singed* in all the bottom and middle Parts, whilst the upper part of the Tree, that was exalted above the Influence of these blasting Mists were left free and untouched; both which Instances shew, that the lowest and best Situations, though naturally defended from the Violence of Winds, yet are subject to these Blights proceeding from hovering Dews, or Vapours frozen in the Night.

To remedy this Misfortune I have proposed the building Walls with *horizontal* Shelters at convenient Distances in Rows, with proper Gaps for leading on the Branches; and this effectually answers the Purpose as far as their Influence extends. But because some Inconvenience hath been found through Mistakes in placing these Shelters, I have since chose rather to recommend *occasional* Shelters of three or four Rows of Deal Boards, which are to be supported by square Bits of Oak left *projecting* about ten or twelve Inches in the Structure of the Wall. The Boards need not be laid on, except during the two dangerous Months of *March* and *April*, and some part of *May*: But it should always be remembered, that the Boards be placed a little *dipping forward* that the Rain may be thrown off from the Wall and the Trees.

Some curious Persons have a Contrivance of putting narrow Slips of Lead betwixt every two Rows of Brick, letting the Lead project during the Time of Danger, and afterwards bending it back, whereon to rest the Fruit to accelerate its ripening.

Others procure matted Straw on long narrow Hurdles about four or five Foot deep: And having already at convenient Distances fastened and placed long Poles reaching from the top of the Wall to the outside of the Border in a Slope; against these, by the Help of two Men, they lean the matted Hurdles, making the upper Edge reach the top of the Wall, and fastening the bottom, lest it slip down, with a *Scotch* in the Poles. And although the greatest Part of the Wall at the bottom lie open; yet it is observed that this way effectually secures the setting off the Fruit; after which both Hurdles and Poles are entirely removed. This we are told was Mr. Speaker *Smith's* Way at his Seat in *Hampshire*, and was (he thought) *improving* the Method of *horizontal* Shelters.

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